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Report On

Specific Absorption Rate Testing of the Sepura SC2124

Covering FCC 47CFR 2.1093, RSS 102 Issue 5
and related documents.

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COMMERCIAL-IN-CONFIDENCE

Document 75944487 Report 09 Issue 01 **November 2019**

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REPORT ON

Specific Absorption Rate Testing of the
Sepura SC2124

Document 75944487 Report 09 Issue 01

November 2019

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DATED

09 March 2020

CONTENTS

SECTION 1

REPORT SUMMARY

Specific Absorption Rate Testing of the
Sepura SC2124

1.1 REPORT MODIFICATION RECORD

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	09 March 2020

1.2 INTRODUCTION

The information contained in this report is intended to show verification of the Specific Absorption Rate Testing of the Sepura SC2124 Portable TETRA Radio 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	Sepura Limited
Manufacturer	Sepura Limited
Manufacturing Description	Portable TETRA Radio.
Model Number	SC2124
Serial/IMEI Number(s)	2PS01832GM32N8 (TETRA radiated/conducted sample) 1PR001909GM18R8 (WLAN radiated sample) 1PR001909GM18RZ (WLAN conducted sample)
Number of Samples Tested	3
Hardware Version	Production Unit
Software Version	SN: 2PS01832GM32N8 = Software version: 200163908522 SN: 1PR001909GM18R8 = Software version: 200171607367 SN: 1PR001909GM18RZ = Software version: 200171607367
Battery Cell Manufacturer	Sepura Limited
Battery Model Numbers	300-01853 (1880mAh) 300-01852 (1160mAh)
Antenna Variants	300-01931 (403-430 MHz) 300-01960 (450-470 MHz) 310-00015 (450-470 MHz)
Test Specification/Issue/Date	KDB 447498 D01 v06 General RF Exposure Guidance
Order Number	PLC-PO013685-1
Date of Receipt of EUT	01/05/2019
Start of Test	10/05/2019
Finish of Test	27/11/2019
Related Documents	FCC 47CFR 2.1093: 2015 KDB 865664 – D01 v01r04 KDB 865664 – D02 v01r02 KDB 648474 – D04 v01r03 KDB 447498 – D01 v06 KDB 643646 – D04 v01r03 KDB 248227 – D01 v02r02 IEEE 1528-2013 RSS 102 Issue 5
Name of Engineers	Stephen Dodd Aasim Butt Michael Evans Mohamud Mohamud

1.3 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	2.24 (Measured)	**2.46** (Scaled)
Max 1g SAR (W/kg) Body	1.35 (Measured)	**1.48** (Scaled)
The maximum 1g volume averaged SAR level measured for all the tests performed did not exceed the limits for Occupation /Controlled Exposure (W/kg) Partial Body of 8.0 W/kg		

The maximum 1g volume averaged SAR found during this Assessment for each supported mode, including estimated SAR for simultaneous transmission

Band	Test Configuration	Max Reported Scaled SAR (W/kg)	Highest Simultaneous Transmission Scaled SAR (W/kg)
Tetra 450 MHz	Head	2.46	2.69
Bluetooth 2450 MHz	Head	0.23*	
Tetra 450 MHz	Head	2.46	**2.71**
WLAN 2450 MHz	Head	0.25	
Tetra 450 MHz	Body	1.48	1.71
Bluetooth 2450 MHz	Body	0.23*	
Tetra 450 MHz	Body	1.48	1.67
WLAN 2450 MHz	Body	0.19	
The maximum 1 g volume averaged SAR level measured for all the tests performed (including simultaneous transmission analysis results) did not exceed the limits for Occupation /Controlled Exposure (W/kg) Partial Body of 8.0 W/kg * - Estimated SAR (Low Power Exemption)			

1.4 TEST RESULTS SUMMARY

1.4.1 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 1528-2013. The following results were obtained: -

System performance / Validation results

Date	Frequency (MHz)	Fluid Type	Measured Max 1g SAR (W/kg) *	Max 1g SAR (W/kg) Target	Percentage Drift on Reference
10/05/2019	450	Head	4.54	4.58	-0.87
13/05/2019	450	Head	4.58	4.58	0.00
29/05/2019	450	Head	4.62	4.58	0.87
30/05/2019	450	Body	4.42	4.69	-5.76
12/09/2019	2450	Body	52.55	51.20	2.64
24/09/2019	2450	Head	53.74	52.40	2.56
25/09/2019	2450	Head	52.15	52.4	-0.48
28/11/2019	450	Body	4.50	4.69	-4.05

*Normalised to a forward power of 1W

1.4.2 Results Summary Tables

TETRA 450 MHz - Antenna 300-01931 - 1880mAh Battery -
Front of Face PTT Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Face	Top	430	34.15	34.5	0.41	0.45	Figure 5
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 300-01960 - 1880mAh Battery -
Front of Face PTT Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Facing	Top	470	34.1	34.5	0.36	0.40	Figure 6
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 310-00015 - 1880mAh Battery -
Front of Face PTT Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Face	Top	470	34.1	34.5	0.62	0.68	Figure 7
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 310-00015 - 1160mAh Battery -
Front of Face PTT Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Face	Top	470	34.1	34.5	0.60	0.65	Figure 8
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR As Per KDB 643646 D01 - This antenna configuration was retested using the low capacity battery as it was the worst case configuration using the high capacity battery.							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 300-01960 - 1880mAh Battery - Front of Face PTT Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Face	Top	2462	15.62	16.5	0.03	0.03	Figure 9
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR KDB248227 D01 v02 - Testing was not required for OFDM as per Section 5.2.2							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 300-01931 - 1880mAh Battery - Front of Face PTT Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Face	Top	2462	15.62	16.5	0.03	0.03	Figure 10
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR KDB248227 D01 v02 - Testing was not required for OFDM as per Section 5.2.2							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 310-00015 - 1880mAh Battery - Front of Face PTT Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Face	Top	2462	15.62	16.5	0.03	0.03	Figure 11
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR KDB248227 D01 v02 - Testing was not required for OFDM as per Section 5.2.2							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 300-01931 - 1160mAh Battery - Front of Face PTT Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Face	Top	2462	15.62	16.5	0.03	0.03	Figure 12
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR As Per KDB 643646 D01 - This antenna configuration was retested using the low capacity battery as it was the worst case configuration using the high capacity battery. (Note: Worst case config found before rounding to 2 decimal places) KDB248227 D01 v02 - Testing was not required for OFDM as per Section 5.2.2							

TETRA 450 MHz - Antenna 300-01931 - 1880mAh Battery -
Head Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	Top	430	34.15	34.5	1.19	1.29	Figure 13
Left Tilt	Top	430	34.15	34.5	1.19	1.29	Figure 14
Right Cheek	Top	430	34.15	34.5	1.04	1.13	Figure 15
Right Tilt	Top	430	34.15	34.5	1.06	1.15	Figure 16
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR.							

TETRA 450 MHz - Antenna 300-01960 - 1880mAh Battery -
Head Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	Top	470	34.1	34.5	1.04	1.14	Figure 17
Left Tilt	Top	470	34.1	34.5	1.11	1.22	Figure 18
Right Cheek	Top	470	34.1	34.5	0.85	0.93	Figure 19
Right Tilt	Top	470	34.1	34.5	0.97	1.06	Figure 20
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 310-00015 - 1880mAh Battery -
Head Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	Top	470	34.1	34.5	1.63	1.79	Figure 21
Left Tilt	Top	470	34.1	34.5	2.24	**2.46**	Figure 22
Right Cheek	Top	470	34.1	34.5	1.33	1.46	Figure 23
Right Tilt	Top	470	34.1	34.5	1.71	1.88	Figure 24
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 310-00015 - 1160mAh Battery -
Head Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Tilt	Top	470	34.1	34.5	2.12	2.33	Figure 25
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 300-01931 - 1880mAh Battery -
Head Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	Top	2462	15.62	16.5	0.205	0.251	Figure 26
Left Tilt	Top	2462	15.62	16.5	0.026	0.031	Figure 27
Right Cheek	Top	2462	15.62	16.5	0.111	0.136	Figure 28
Right Tilt	Top	2462	15.62	16.5	0.007	0.008	Figure 29
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR. KDB 248227 D01 v02 - Testing was not required for OFDM as per Section 5.2.2							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 300-01960 - 1880mAh Battery -
Head Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	Top	2462	15.62	16.5	0.187	0.229	Figure 30
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR. Worst case position used from Antenna 300-0191 Tests used. KDB 248227 D01 v02 - Testing was not required for OFDM as per Section 5.2.2							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 310-00015 - 1880mAh Battery -
Head Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	Top	2462	15.62	16.5	0.183	0.224	Figure 31
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR. Worst case position used from Antenna 300-0191 Tests used. As Per KDB 643646 D01 - This antenna configuration was retested using the low capacity battery as it was the worst case configuration using the high capacity battery. KDB 248227 D01 v02 - Testing was not required for OFDM as per Section 5.2.2							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 300-01931 - 1160mAh Battery - Head Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	Top	2462	15.62	16.5	0.184	0.225	Figure 32
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A1 - Highest capacity battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR. KDB 248227 D01 v02 - Testing was not required for OFDM as per Section 5.2.2							

TETRA 450 MHz - Antenna 300-01931 - 1160mAh Battery - Holster 300-01917 (Click Fast) - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	430	34.15	34.5	0.65	0.70	Figure 33
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 300-01931 - 1160mAh Battery - Holster 300-01915 (Leather) - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	430	34.15	34.5	0.67	0.72	Figure 34
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 300-01931 - 1160mAh Battery - Large Belt Clip 300-01923 - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	430	34.15	34.5	0.46	0.50	Figure 35
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 300-01931 - 1160mAh Battery – Shirt Pocket Clip 300-01922 - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	430	34.15	34.5	0.66	0.71	Figure 36
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 300-01931 - 1160mAh Battery - Holster 300-01916 (Nylon) - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	430	34.15	34.5	0.73	0.79	Figure 37
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 300-01960 - 1160mAh Battery - Holster 300-01917 (Click Fast) - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	0.48	0.52	Figure 38
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 300-01960 - 1160mAh Battery - Holster 300-01915 (Leather) - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	0.52	0.57	Figure 39
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 300-01960 - 1160mAh Battery - Large Belt Clip 300-01923 - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	0.62	0.68	Figure 40
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 300-01960 - 1160mAh Battery – Shirt Pocket Clip 300-01922 - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	0.56	0.62	Figure 41
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 300-01960 - 1160mAh Battery - Holster 300-01916 (Nylon) - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	0.30	0.42	Figure 42
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 310-00015 - 1160mAh Battery - Holster 300-01917 (Click Fast) - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	1.06	1.16	Figure 43
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 310-00015 - 1160mAh Battery - Holster 300-01915 (Leather) - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	1.05	1.15	Figure 44
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 310-00015 - 1160mAh Battery - Large Belt Clip 300-01923 - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	0.75	0.83	Figure 45
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 310-00015 - 1160mAh Battery – Shirt Pocket Clip 300-01922 - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	1.07	1.17	Figure 46
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR.							

TETRA 450 MHz - Antenna 310-00015 - 1160mAh Battery - Holster 300-01916 (Nylon) - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	1.35	1.48	Figure 47
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 310-00015 - 1160mAh Battery - Holster 300-01916 (Nylon) - RSM Attached - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	1.20	1.32	Figure 48
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR							

TETRA 450 MHz - Antenna 310-00015 - 1880mAh Battery - Holster 300-01916 (Nylon) - Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	470	34.1	34.5	0.92	1.01	Figure 49
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR As Per KDB 643646 D01 - This antenna/ accessory configuration was retested using the high capacity battery as it was the worst case configuration using the lower capacity battery.							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 300-01960 - 1160mAh Battery - Holster 300-01916 (Nylon) -
Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	2462	15.62	16.5	0.152	0.186	50
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR As Per KDB 643646 D01 - This antenna/ accessory configuration was retested using the high capacity battery as it was the worst case configuration using the lower capacity battery. KDB 248227 D01 v02 - Testing was not required for OFDM as per Section 5.2.2							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 300-01931 - 1160mAh Battery - Holster 300-01916 (Nylon) -
Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	2462	15.62	16.5	0.148	0.181	51
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR As Per KDB 643646 D01 - This antenna/ accessory configuration was retested using the high capacity battery as it was the worst case configuration using the lower capacity battery. KDB 248227 D01 v02 - Testing was not required for OFDM as per Section 5.2.2							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 310-00015 - 1160mAh Battery - Holster 300-01916 (Nylon) -
Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	2462	15.62	16.5	0.148	0.181	52
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR As Per KDB 643646 D01 - This antenna/ accessory configuration was retested using the high capacity battery as it was the worst case configuration using the lower capacity battery.							

WLAN 2450 MHz - 802.11b 20 MHz 1 Mbps - Antenna 300-01931 - 1880mAh Battery - Holster 300-01916 (Nylon) -
Body Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear Facing	Top	2462	15.62	16.5	0.145	0.178	53
Limit for Occupation (Controlled Exposure) 8.0 W/kg (1g) KDB 643646 D01 - Testing of other required channels was not necessary as the SAR was ≤ 3.5 W/kg KDB 643646 D01 Appendix A2 - Thinnest battery used as default – When SAR ≤ 4.0 W/kg Test additional batteries using the antenna and channel configuration which resulted in the highest SAR As Per KDB 643646 D01 - This antenna/ accessory configuration was retested using the high capacity battery as it was the worst case configuration using the lower capacity battery.							

1.4.3 Standalone SAR Estimation

When the standalone SAR test exclusion of KDB 447498 D01 section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion. The estimated SAR is only used to determine simultaneous transmission SAR test exclusion; When SAR is estimated, it must be applied to determine the sum of 1-g SAR test exclusion. When SAR to peak location separation ratio test exclusion is applied, the highest reported SAR for simultaneous transmission can be an estimated standalone SAR if the estimated SAR is the highest among the simultaneously transmitting antennas (see KDB 690783).

(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/7.5] W/kg for test separation distances ≤ 50 mm;

where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR

when the minimum test separation distance is <5mm, a distance of 5mm is applied.

Bluetooth SAR Estimation

Test Configuration	Frequency (MHz)	Maximum Power (mW)	Distance (mm)	Estimated 1g SAR (W/kg)
Head	2480	5.47	5*	0.230
Body	2480	5.47	5*	0.230

* Worst case separation distance used

1.4.4 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.

RAT & Band	Frequency (MHz)	Power (dBm)	Power (mW)	Test Position	Distance (mm)	Threshold	Test Exclusion
TETRA - 450MHz	470	34.5	2818.4	Head	5	386.4	No
TETRA - 450MHz	470	34.5	2818.4	Body	5	386.4	No
Bluetooth	2480	7.38	5.47	Head	5	1.7	Yes
Bluetooth	2480	7.38	5.47	Body	5	1.7	Yes
WLAN	2462	16.5	44.67	Head	5	14.0	No
WLAN	2462	16.5	44.67	Body	5	14.0	No

1.4.5 Technical Description

The equipment under test (EUT) was a Sepura SC2124 Portable TETRA Radio for use by the emergency services. A full technical description can be found in the manufacturer's documentation.

1.4.6 Test Configuration and Modes of Operation

The testing was performed with two battery variants (1160 mAh and 1880 mAh) which were supplied by Sepura Limited and manufactured by Varta. The batteries were fully charged before each measurement and there were no external connections.

SAR testing was performed using three antenna variants over two frequency bands:
Part no: 300-01931 (403-430 MHz.)
Part no: 310-00015 (450-470 MHz.)
Part no: 300-01960 (450-470 MHz.)

For head SAR assessment, Tetra testing was performed with the EUT in the declared normal position of operation for the 403 MHz – 430 MHz and 450 – 470 MHz frequency bands at the maximum specified power level. WLAN testing for the 2450 MHz frequency band, against the head, was performed in all test positions with extended helical antenna part no 300-01931 and 1880 mAh battery fitted to the radio, once the worst case position was found this was retested with the other two antenna variants fitted to the radio, one the overall worst case configuration was found it was retested using the 1880mAh battery. The EUT was placed against a Specific Anthropomorphic Mannequin (SAM) phantom. The phantom was filled with simulant liquid appropriate to the frequency band. The dielectric properties were measured and found to be in accordance with the requirements for the dielectric properties specified in KDB 865665. Testing was performed at both the left and right ear of the phantom at both handset positions stated in the applied specification using the 1880mAh battery and all antennas. For the position and antenna which yielded the highest SAR level, a repeated scan was performed using the 1160mAh battery.

For front of face SAR assessment, Tetra testing was performed with the device in the intended normal position of operation for the 403 MHz – 430 MHz and 450 – 470 MHz frequency bands at maximum power. WLAN testing was performed with the device in the intended normal position of operation for the 2450 MHz frequency bands at maximum power. The handset was placed at a distance of 25 mm from the bottom of the flat phantom for all front of face testing. The phantom was filled to a depth of 150 mm with the appropriate head simulant liquid. The dielectric properties were in accordance with the requirements specified in KDB 865664 D01. Testing was performed using the 1880mAh battery and all antennas. For the antenna which yielded the highest SAR level, a repeated scan was performed using the 1160mAh battery.

For body SAR assessment, Tetra testing was performed for the 403 MHz – 430 MHz and 450 – 470 MHz frequency bands at the maximum specified power levels, using various body worn accessories, of which all contain metal components. Model Numbers: 300-01916,300-01922, 300-01923, 300-01915, 300-01917 (Klick fast holder.) Body SAR testing was carried out with the device inside the holsters or with a belt clip attached at 0 mm separation distance between the accessory and the Elliptical Flat Phantom The separation distances caused by each accessory configuration is tabulated below.

Body Accessory	Battery	Separation distance EUT to phantom (mm)	Separation distance antenna to phantom (mm)
300-01916 - Nylon holster with belt clip	300-01852 (1160 mAh)	11.0	15.0
300-01915 - Lightweight leather case	300-01852 (1160 mAh)	14.0	18.0
300-01917 - Leather Klick fast holster	300-01852 (1160 mAh)	17.0	21.0
300-01923 - Large belt clip	300-01852 (1160 mAh)	23.0	27.0
300-01922 - Shirt pocket clip (small)	300-01852 (1160 mAh)	13.0	17.0
300-01916 - Nylon holster with belt clip	300-01852 (1160 mAh)	11.0	15.0
300-01916 - Nylon holster with belt clip	300-01853 (1880 mAh)	11.0	19.7

Testing was performed using the 1160mAh battery and all antennas. For the antenna/ body worn accessory combination which yielded the highest SAR level, a repeated scan was performed using the 1880mAh battery. For the antenna/ body worn accessory/ battery combination that resulted in the highest measured SAR, a scan was repeated with a remote speaker/ microphone (300-00389) fitted to the EUT. The remote speaker / microphone (RSM) is of a non-radiating type.

WLAN body SAR assessment was performed using the body worn accessory which yielded the smallest separation between the radio and the phantom using the 1160 mAh battery and all Tetra antenna variant fitted to the radio, the configuration which yielded the worst-case result was retested using 1880 mAh battery.

The Elliptical Flat Phantom dimensions are 600 mm major axis and 400 mm minor axis with a shell thickness of 2.00 mm. The phantom was filled to a minimum depth of 150 mm with the appropriate Body simulant liquid. The dielectric properties were measured and found to be in accordance with the requirements specified in KDB 865664 D01.

For each scan, the EUT was configured into a continuous transmission test mode using software provided by Sepura PLC.

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

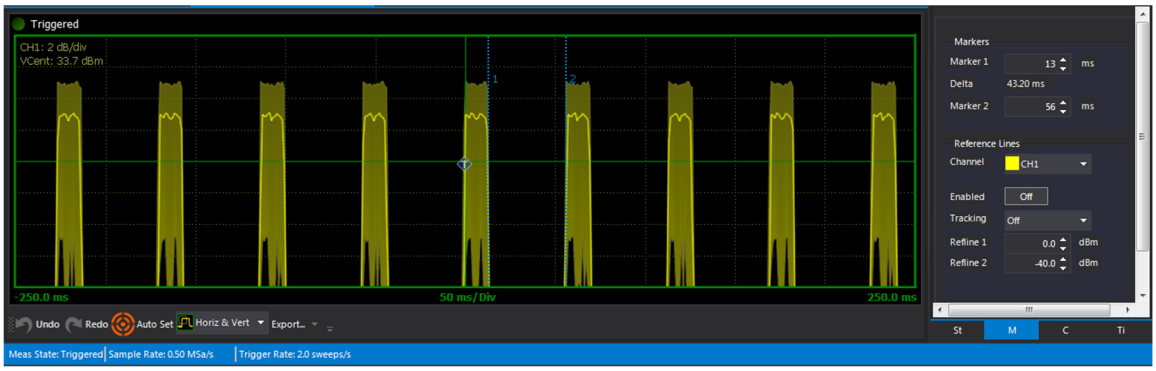
1.5 PTT DUTY CYCLE MEASUREMENTS / POWER MEASUREMENTS

1.5.1 Requirement

If a device has push-to-talk capability, a minimum duty cycle of 50% (on-time) shall be used in the evaluation. A lower duty cycle is permitted only if the transmission duty cycle is an inherent property of the technology or of the design of the equipment and not under user control. Proof of the various on-off durations and a detailed method of calculation of the average power shall be included in the SAR evaluation.

The EUT was operated in continuous transmit (100 % PTT on). However, due to the characteristics of the EUT's TETRA technology the transmitter is only active for 25 % of the time due to the single time slot inherent duty factor.

1.5.2 Duty Cycle Measurements



Transmit On time = 13mS
Frame length = 56 mS

1.5.3 Conducted Power Measurements

Tetra 450 MHz

Mode	Frequency (MHz)	Duty Cycle (%)	Burst Average Power (dBm)	Tune Up (dBm)
Tetra	403.00	25.0	34.00	34.50
Tetra	416.50	25.0	34.05	34.50
Tetra	430.00	25.0	34.15	34.50
Tetra	450.00	25.0	34.00	34.50
Tetra	460.00	25.0	34.05	34.50
Tetra	470.00	25.0	34.10	34.50

Conducted power measurements were made using a power meter.

WLAN 2450 MHz

Technology	Frequency (MHz)	Rate (Mbps)	Channel Bandwidth (MHz)	Measured Power (dBm)
802.11b	2412	1	20	15.19
802.11b	2437	1	20	15.60
802.11b	2462	1	20	15.62
802.11b	2437	2	20	15.54
802.11b	2437	5.5	20	15.31
802.11b	2437	11	20	14.90
802.11g	2437	6	20	15.25
802.11g	2437	9	20	15.05
802.11g	2437	12	20	14.66
802.11g	2437	18	20	14.44
802.11g	2437	24	20	13.01
802.11g	2437	36	20	11.38
802.11g	2437	48	20	10.32
802.11g	2437	54	20	9.31
802.11n	2437	6.5	20	14.52
802.11n	2437	13	20	13.99
802.11n	2437	19.5	20	13.48
802.11n	2437	26	20	13.21
802.11n	2437	39	20	11.53
802.11n	2437	52	20	10.56
802.11n	2437	58.5	20	9.49
802.11n	2437	65	20	8.19
802.11n	2437	6.5	40	12.77
802.11n	2437	13	40	11.90
802.11n	2437	19.5	40	11.26
802.11n	2437	26	40	10.78
802.11n	2437	39	40	9.94
802.11n	2437	52	40	8.16
802.11n	2437	58.5	40	7.88
802.11n	2437	65	40	6.44

Conducted power measurements were made using a power meter.
Maximum Declared out power for WLAN is 16.5 dBm

SECTION 2

TEST DETAILS

Specific Absorption Rate Testing of the
Sepura SC2124

2.1 DASY5 MEASUREMENT SYSTEM

2.1.1 System Description

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

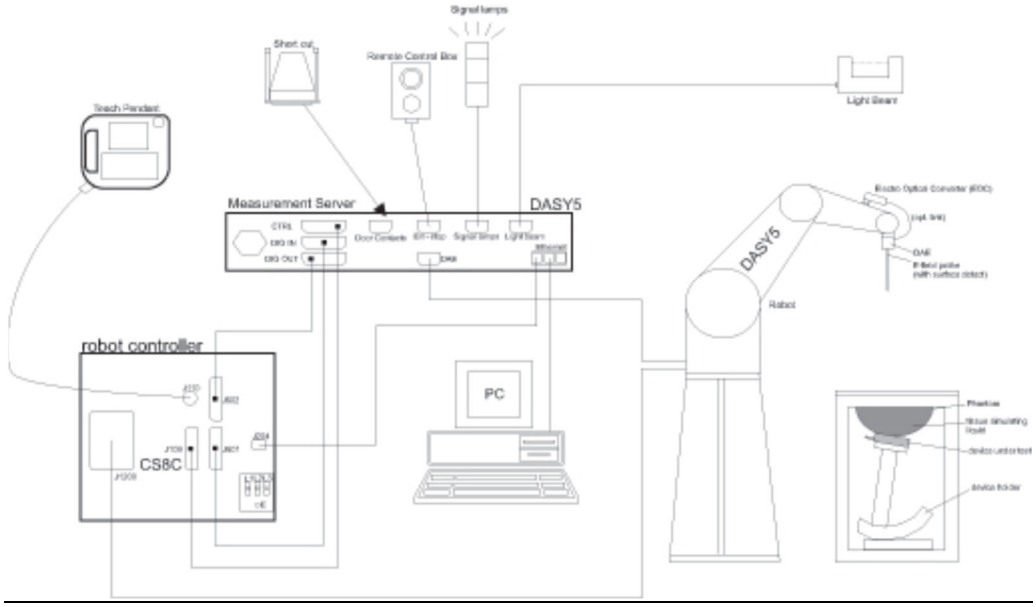


Figure 1 System Description Diagram

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.

An Area scan was performed using a 15 mm resolution between measurement points to determine the peak SAR location, once found a “Zoom scan” evaluation is performed.
The base for the evaluation is a "cube" measurement in a volume of 30 mm3 (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. 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 Spatial 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.

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.

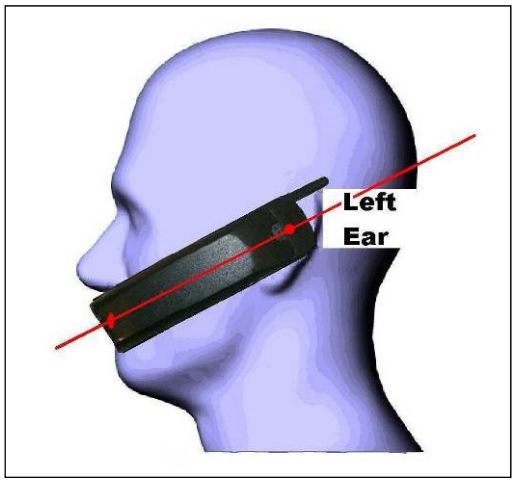


Figure 2 Side view of mobile next to head showing alignment

The Cheek Position

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.

The Tilt Position

The Tilt 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 Tilt.

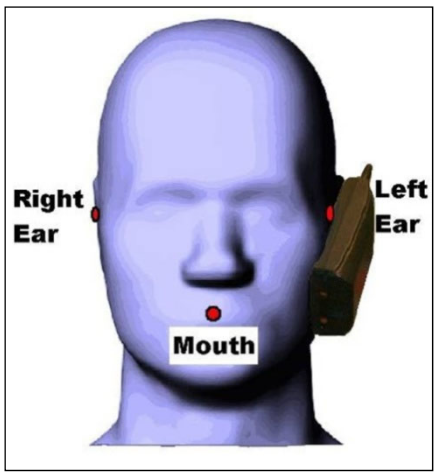


Figure 3 Cheek position

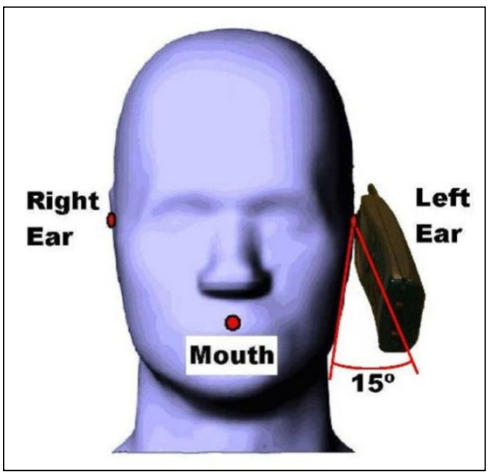


Figure 4 Tilt Position

2.2 TETRA 450 MHz - FRONT OF FACE - PTT - SAR TEST RESULTS

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	29/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.844 S/m
DUT CONFIGURATION:	Antenna-300-01931-1880mAh Battery	**RELATIVE PERMITTIVITY:**	43.81
DUT POSITION:	25mm - Front Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	430 MHz	**DRIFT:**	0.02 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.57 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.45 W/kg

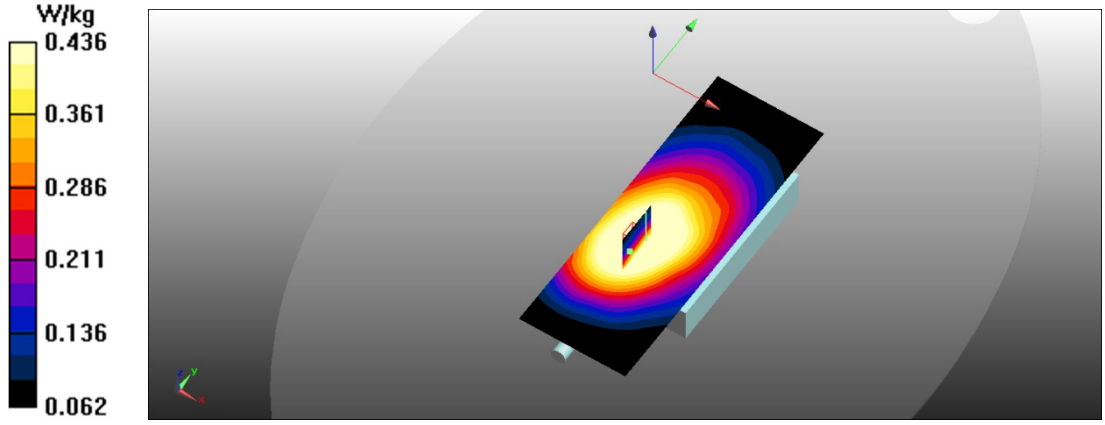


Figure 5: SAR Front Of Face Testing Results for the SC2124 at 430 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	29/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.876 S/m
DUT CONFIGURATION:	Antenna-300-01960-1880mAh Battery	**RELATIVE PERMITTIVITY:**	42.905
DUT POSITION:	25mm - Front Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.04 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.52 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.40 W/kg

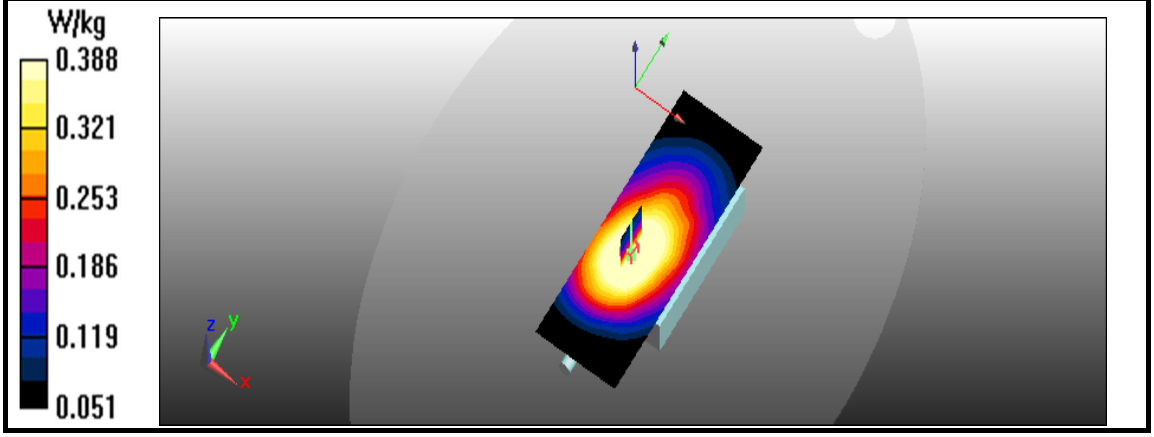


Figure 6: SAR Front Of Face Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	29/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.876 S/m
DUT CONFIGURATION:	Antenna-310-00015-1880mAh Battery	**RELATIVE PERMITTIVITY:**	42.905
DUT POSITION:	25mm - Front Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.03 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.82 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.68 W/kg

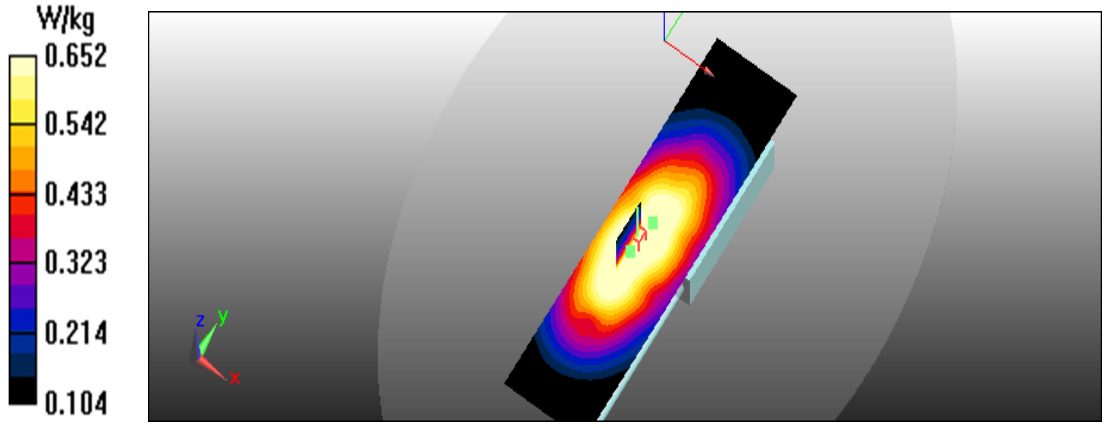


Figure 7: SAR Front Of Face Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	29/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.876 S/m
DUT CONFIGURATION:	Antenna-310-00015-1160mAh Battery	**RELATIVE PERMITTIVITY:**	42.905
DUT POSITION:	25mm - Front Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	0.02 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.82 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.65 W/kg

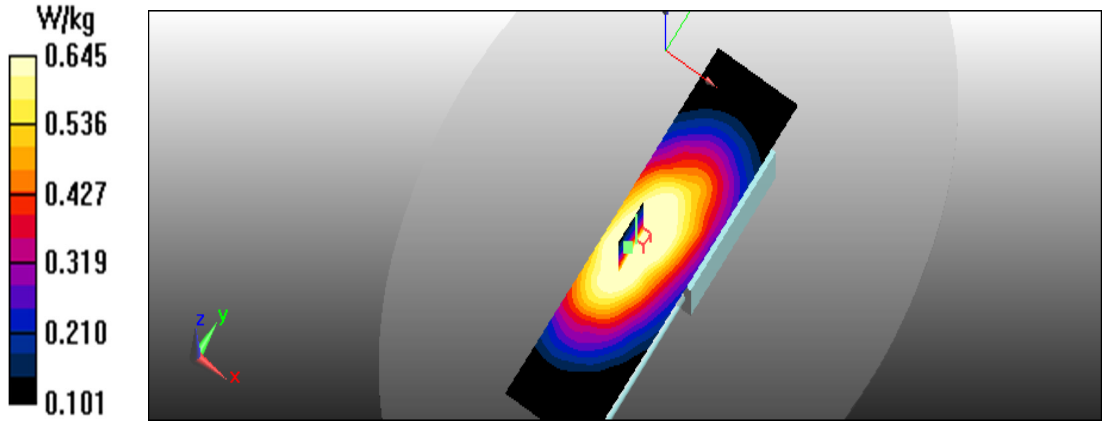


Figure 8: SAR Front Of Face Testing Results for the SC2124 at 470 MHz.

2.3 WLAN 2450 MHz - 802.11b 20MHz 1Mbps - FRONT OF FACE - PTT - SAR TEST RESULTS

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	23.2 °C
DATE:	12/09/2019	**RELATIVE HUMIDITY:**	52.4 %
PHANTOM:	QD OVA 004 Ax	**CONDUCTIVITY:**	1.81 S/m
DUT CONFIGURATION:	300-01960- 1880mAh Battery	**RELATIVE PERMITTIVITY:**	40.605
DUT POSITION:	25mm - Front Face	**LIQUID TEMPERATURE:**	22.2 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	0.12 dB
MODULATION:	DSSS	**PEAK SAR:**	0.04 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.03 W/kg

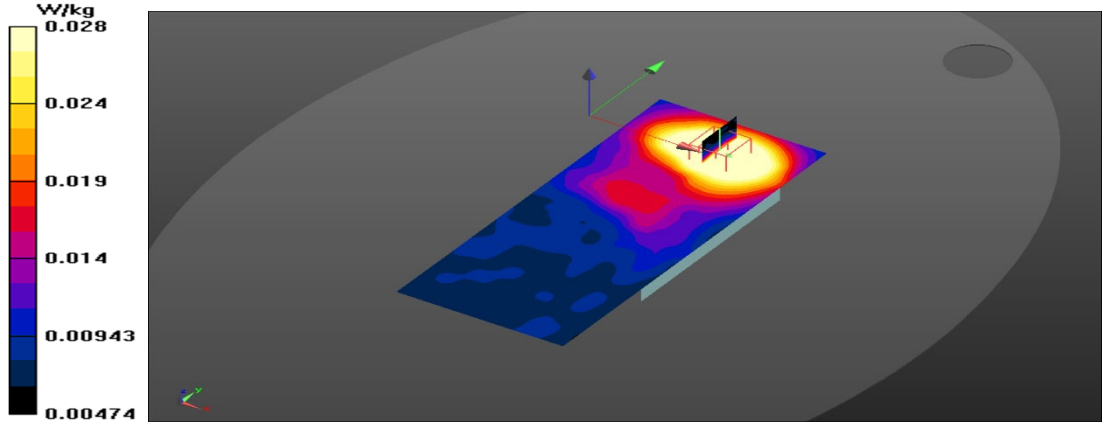


Figure 9: SAR Front Of Face Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	23.2 °C
DATE:	12/09/2019	**RELATIVE HUMIDITY:**	52.4 %
PHANTOM:	QD OVA 004 Ax	**CONDUCTIVITY:**	1.81 S/m
DUT CONFIGURATION:	300-01931- 1880mAh Battery	**RELATIVE PERMITTIVITY:**	40.605
DUT POSITION:	25mm - Front Face	**LIQUID TEMPERATURE:**	22.2 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	0.11 dB
MODULATION:	DSSS	**PEAK SAR:**	0.04 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.03 W/kg

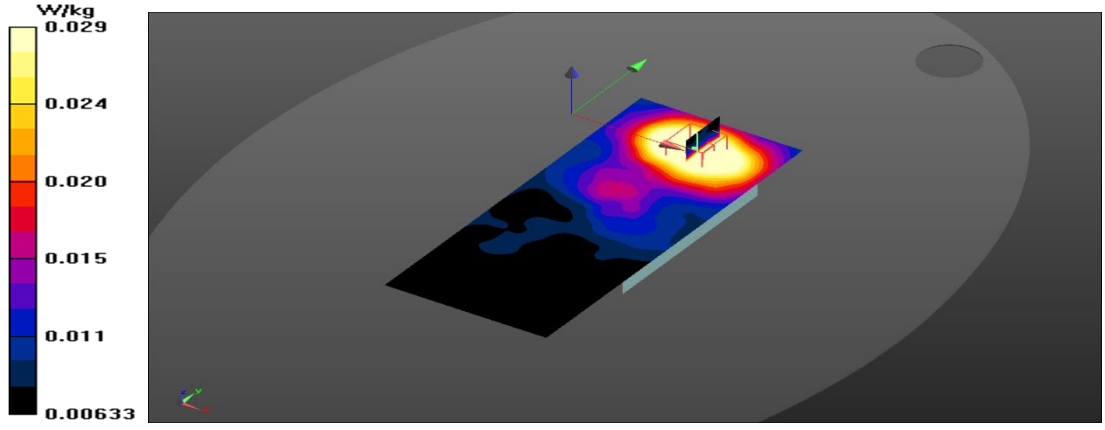


Figure 10: SAR Front Of Face Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	23.2 °C
DATE:	12/09/2019	**RELATIVE HUMIDITY:**	52.4 %
PHANTOM:	QD OVA 004 Ax	**CONDUCTIVITY:**	1.81 S/m
DUT CONFIGURATION:	310-00015- 1880mAh Battery	**RELATIVE PERMITTIVITY:**	40.605
DUT POSITION:	25mm - Front Face	**LIQUID TEMPERATURE:**	22.2 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	0.19 dB
MODULATION:	DSSS	**PEAK SAR:**	0.05 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.03 W/kg

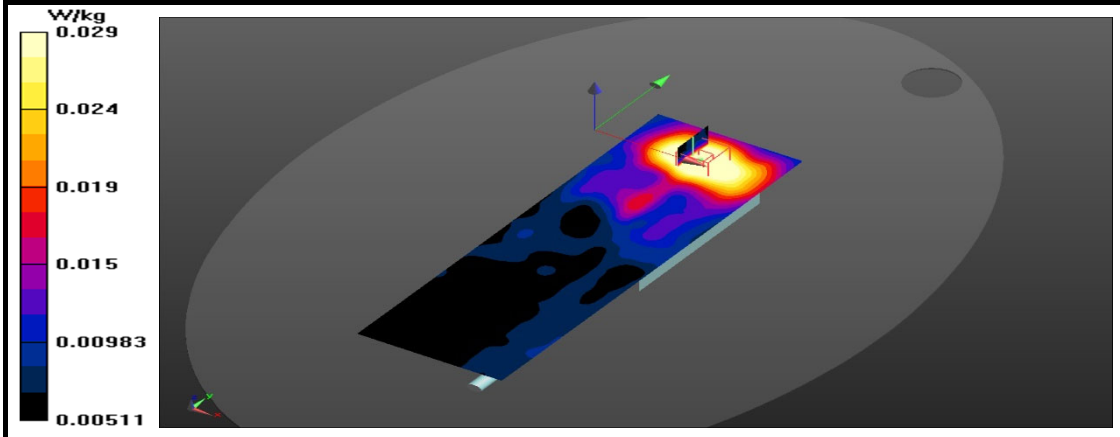


Figure 11: SAR Front Of Face Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	23.2 °C
DATE:	12/09/2019	**RELATIVE HUMIDITY:**	52.4 %
PHANTOM:	QD OVA 004 Ax	**CONDUCTIVITY:**	1.81 S/m
DUT CONFIGURATION:	300-01931- 1160mAh Battery	**RELATIVE PERMITTIVITY:**	40.605
DUT POSITION:	25mm - Front Face	**LIQUID TEMPERATURE:**	22.2 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	0.11 dB
MODULATION:	DSSS	**PEAK SAR:**	0.05 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.03 W/kg

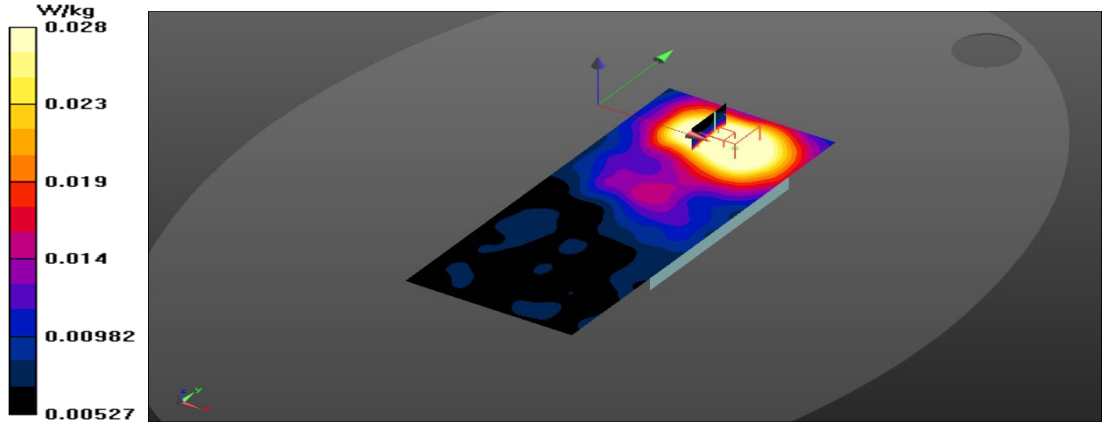


Figure 12: SAR Front Of Face Testing Results for the SC2124 at 2462 MHz.

2.4 TETRA 450 MHz - HEAD SAR TEST RESULTS

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	13/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.877 S/m
DUT CONFIGURATION:	Antenna-300-01931-1880mAh Battery	**RELATIVE PERMITTIVITY:**	46.427
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	430 MHz	**DRIFT:**	-0.15 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.80 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.29 W/kg

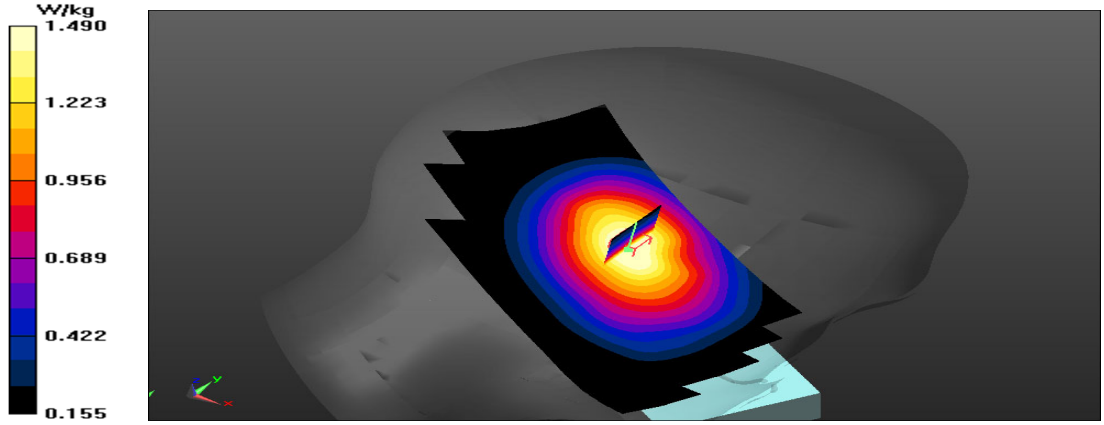


Figure 13: SAR Head Testing Results for the SC2124 at 430 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	13/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.877 S/m
DUT CONFIGURATION:	Antenna-300-01931-1880mAh Battery	**RELATIVE PERMITTIVITY:**	46.427
DUT POSITION:	Left - Tilt	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	430 MHz	**DRIFT:**	0.12 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	2.26 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.29 W/kg

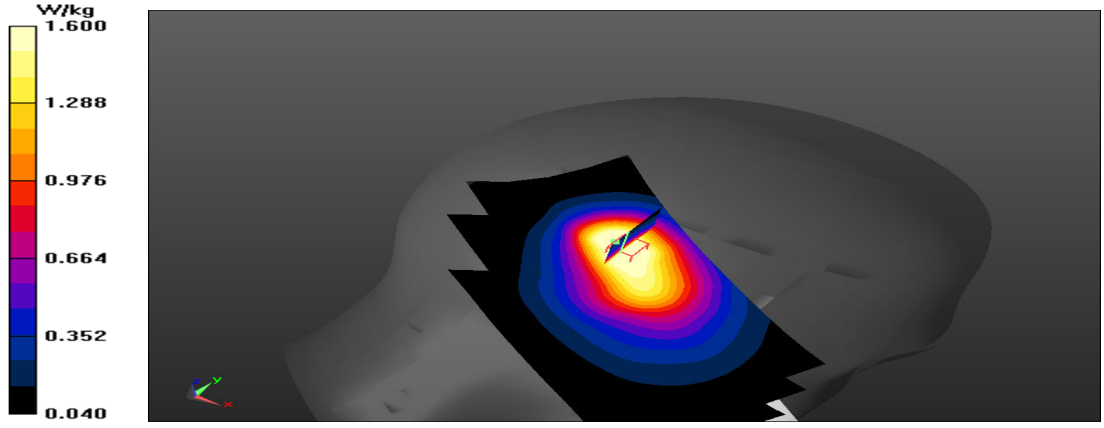


Figure 14: SAR Head Testing Results for the SC2124 at 430 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	10/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.858 S/m
DUT CONFIGURATION:	Antenna-300-01931-1880mAh Battery	**RELATIVE PERMITTIVITY:**	45.262
DUT POSITION:	Right - Cheek	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	430 MHz	**DRIFT:**	0.25 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.49 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.13 W/kg

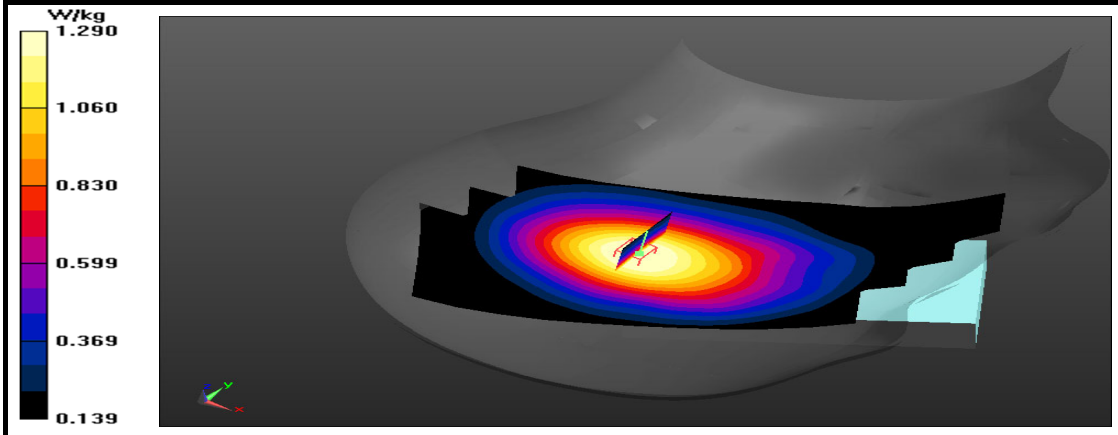


Figure 15: SAR Head Testing Results for the SC2124 at 430 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	10/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.858 S/m
DUT CONFIGURATION:	Antenna-300-01931-1880mAh Battery	**RELATIVE PERMITTIVITY:**	45.262
DUT POSITION:	Right - Tilt	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	430 MHz	**DRIFT:**	0.05 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.58 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.15 W/kg

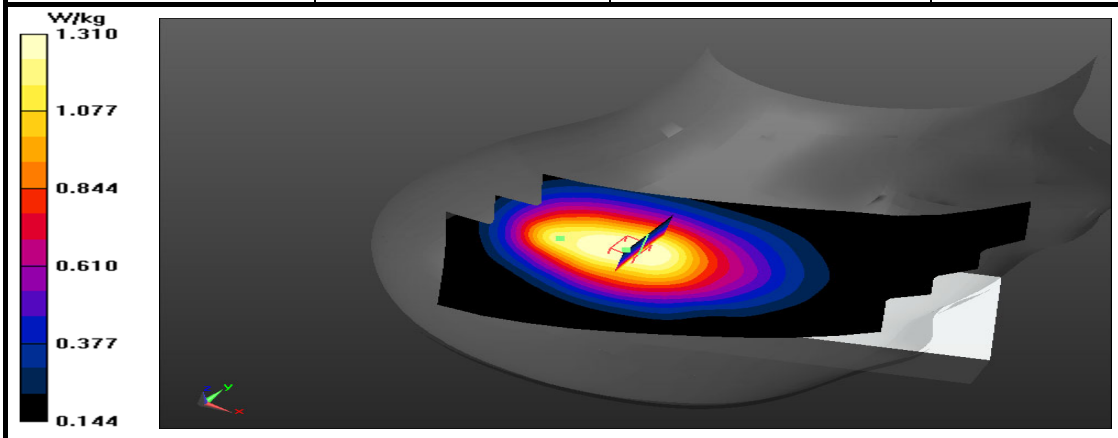


Figure 16: SAR Head Testing Results for the SC2124 at 430 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	10/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.892 S/m
DUT CONFIGURATION:	Antenna-300-01960-1880mAh Battery	**RELATIVE PERMITTIVITY:**	44.366
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	0.19 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.32 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.64 W/kg

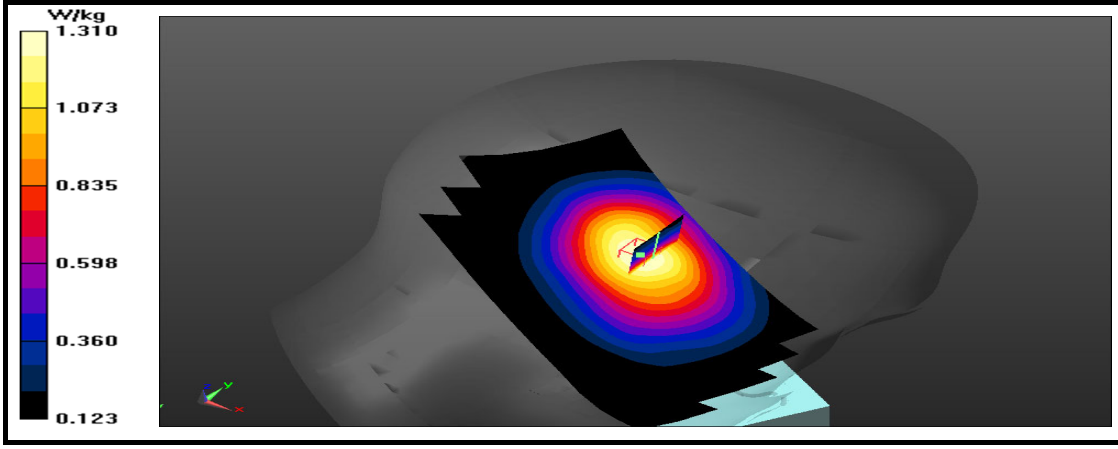


Figure 17: SAR Head Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	10/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.892 S/m
DUT CONFIGURATION:	Antenna-300-01960-1880mAh Battery	**RELATIVE PERMITTIVITY:**	44.366
DUT POSITION:	Left - Tilt	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	0.06 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.84 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.22 W/kg

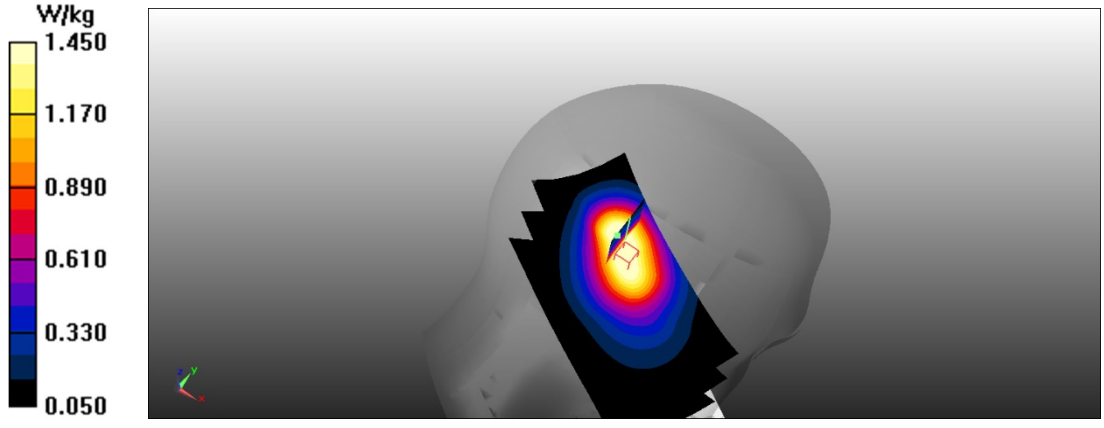


Figure 18: SAR Head Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	10/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.892 S/m
DUT CONFIGURATION:	Antenna-300-01960-1880mAh Battery	**RELATIVE PERMITTIVITY:**	44.366
DUT POSITION:	Right - Cheek	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	0.25 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.23 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.93 W/kg

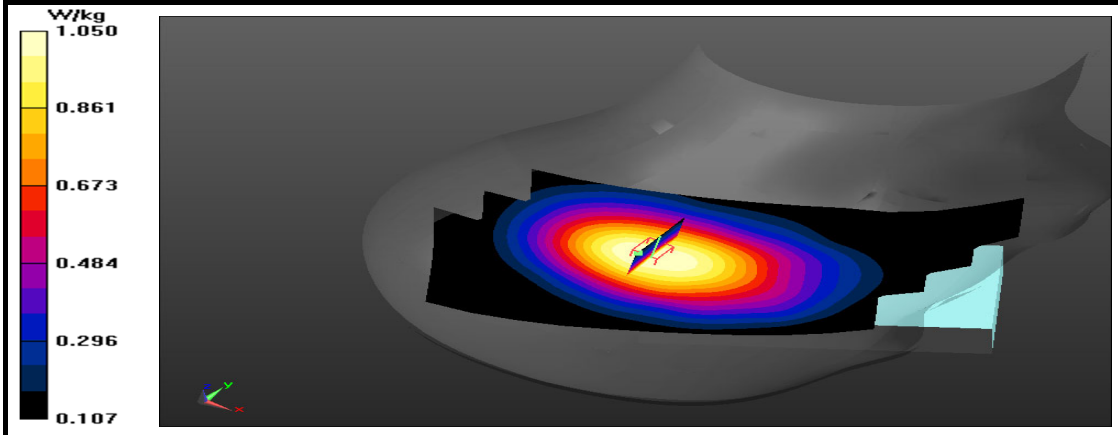


Figure 19: SAR Head Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	10/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.892 S/m
DUT CONFIGURATION:	Antenna-300-01960-1880mAh Battery	**RELATIVE PERMITTIVITY:**	44.366
DUT POSITION:	Right - Tilt	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.04 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.43 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.06 W/kg

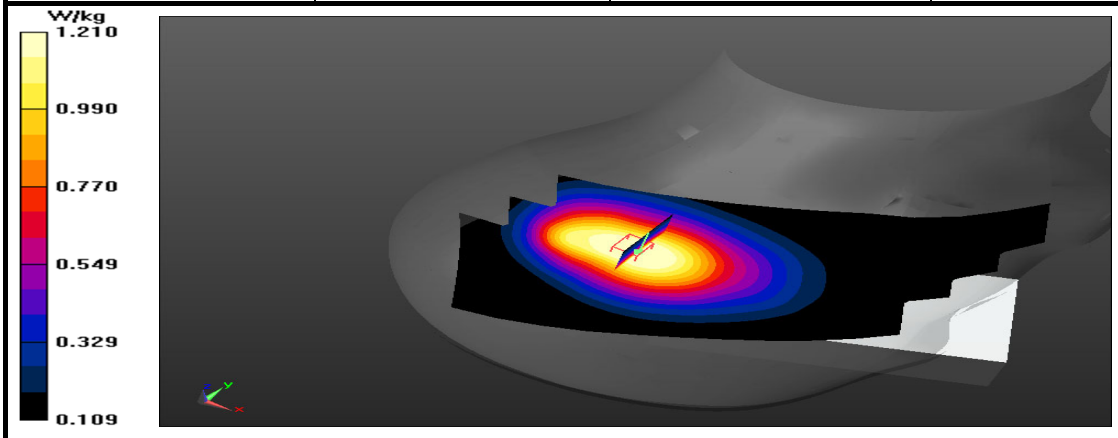


Figure 20: SAR Head Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	10/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.892 S/m
DUT CONFIGURATION:	Antenna-310-00015-1880mAh Battery	**RELATIVE PERMITTIVITY:**	44.366
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	0.24 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	2.41 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.79 W/kg

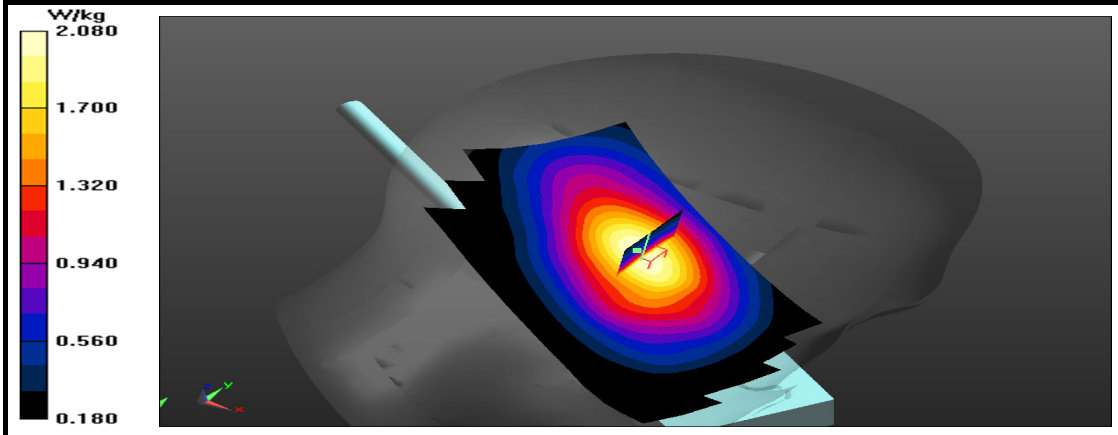


Figure 21: SAR Head Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	10/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.892 S/m
DUT CONFIGURATION:	Antenna-310-00015-1880mAh Battery	**RELATIVE PERMITTIVITY:**	44.366
DUT POSITION:	Left - Tilt	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.72 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	3.40 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	2.46 W/kg

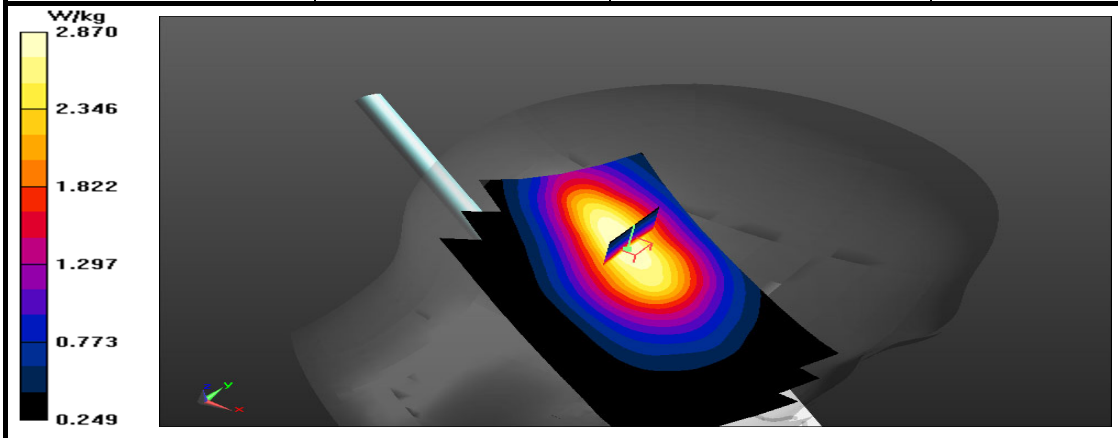


Figure 22: SAR Head Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	10/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.892 S/m
DUT CONFIGURATION:	Antenna-310-00015-1880mAh Battery	**RELATIVE PERMITTIVITY:**	44.366
DUT POSITION:	Right - Cheek	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.21 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.89 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.46 W/kg

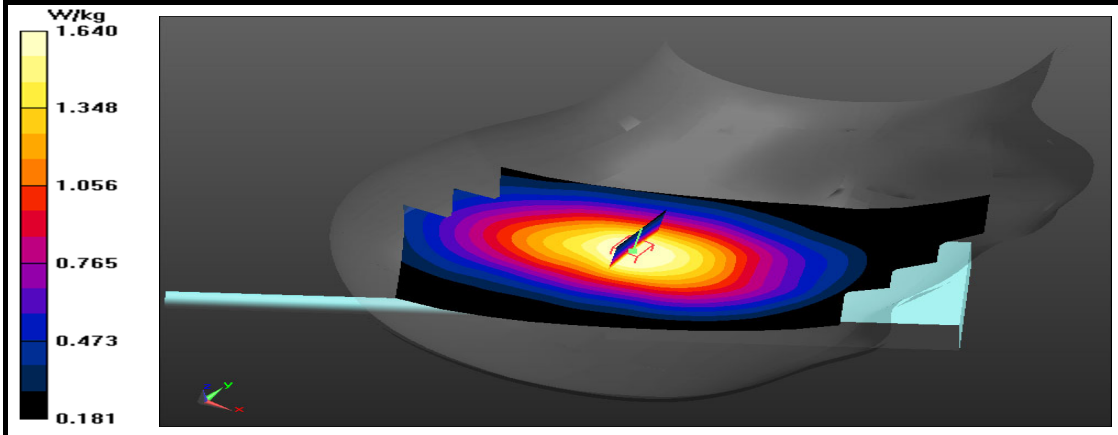


Figure 23: SAR Head Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	10/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.892 S/m
DUT CONFIGURATION:	Antenna-310-00015-1880mAh Battery	**RELATIVE PERMITTIVITY:**	44.366
DUT POSITION:	Right - Tilt	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.24 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	2.53 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.88 W/kg

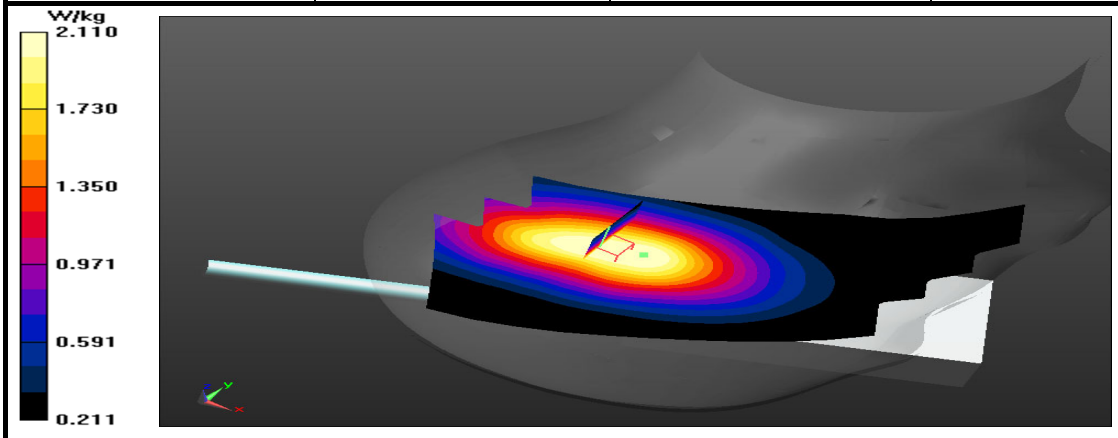


Figure 24: SAR Head Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	24.0 °C
DATE:	13/05/2019	**RELATIVE HUMIDITY:**	26.8 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.892 S/m
DUT CONFIGURATION:	Antenna-310-00015-1160mAh Battery	**RELATIVE PERMITTIVITY:**	44.366
DUT POSITION:	Left - Tilt	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.11 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	3.41 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	2.33 W/kg

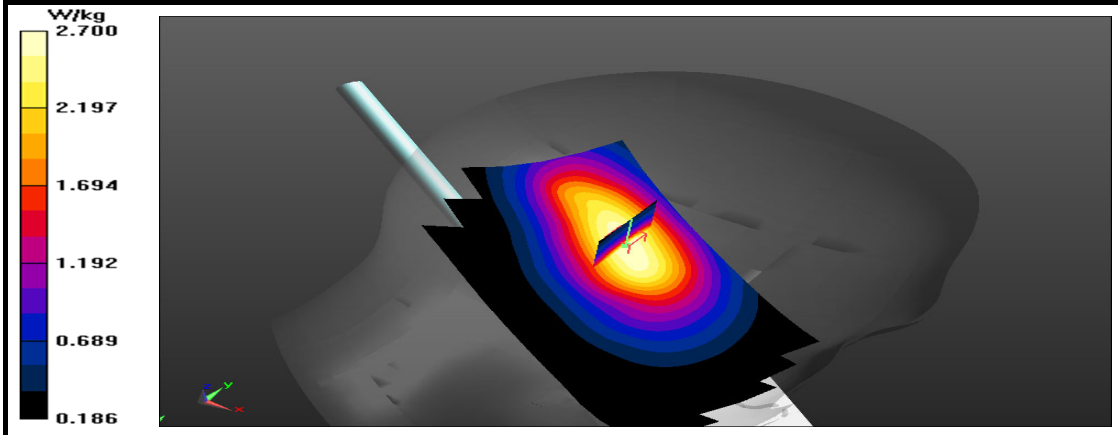


Figure 25: SAR Head Testing Results for the SC2124 at 470 MHz.

2.5 WLAN 2450 MHz - 802.11b 20MHz 1Mbps - HEAD SAR TEST RESULTS

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.2 °C
DATE:	24/09/2019	**RELATIVE HUMIDITY:**	39.6 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	1.928 S/m
DUT CONFIGURATION:	Antenna-300-01931-1880mAh Battery	**RELATIVE PERMITTIVITY:**	39.455
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	-0.00 dB
MODULATION:	DSSS	**PEAK SAR:**	0.37 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.25 W/kg

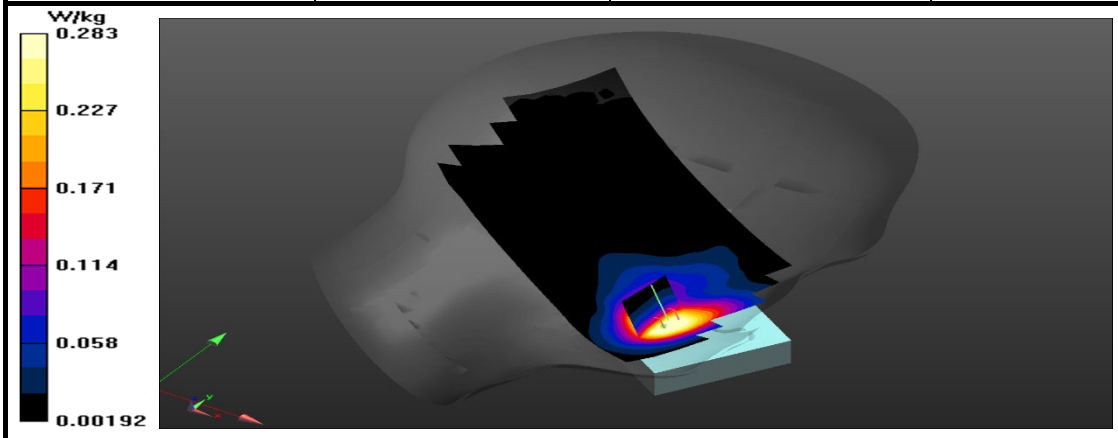


Figure 26: SAR Head Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.5 °C
DATE:	25/09/2019	**RELATIVE HUMIDITY:**	42.6 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	1.928 S/m
DUT CONFIGURATION:	Antenna-300-01931-1880mAh Battery	**RELATIVE PERMITTIVITY:**	39.455
DUT POSITION:	Left - Tilt	**LIQUID TEMPERATURE:**	22.0 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	0.02 dB
MODULATION:	DSSS	**PEAK SAR:**	0.04 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.03 W/kg

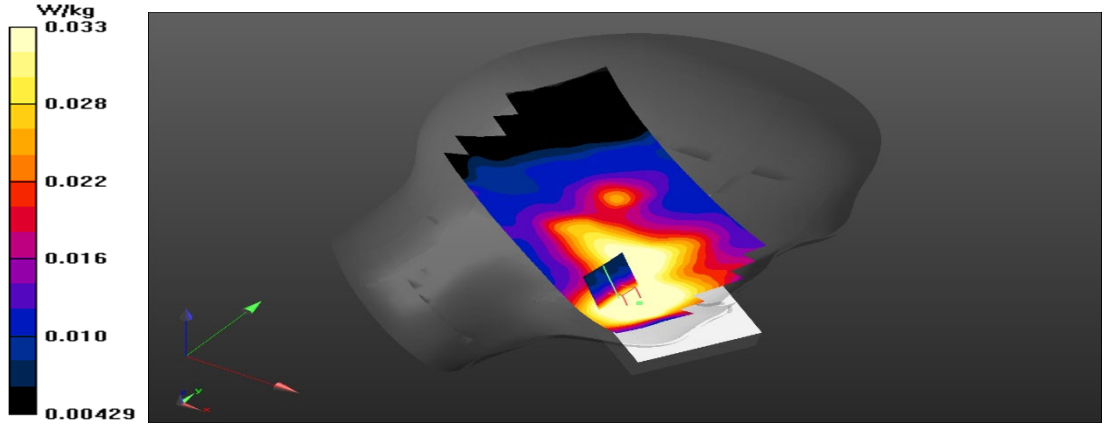


Figure 27: SAR Head Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.2 °C
DATE:	24/09/2019	**RELATIVE HUMIDITY:**	39.6 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	1.928 S/m
DUT CONFIGURATION:	Antenna-300-01931-1880mAh Battery	**RELATIVE PERMITTIVITY:**	39.455
DUT POSITION:	Right - Cheek	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	0.07 dB
MODULATION:	DSSS	**PEAK SAR:**	0.19 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.14 W/kg

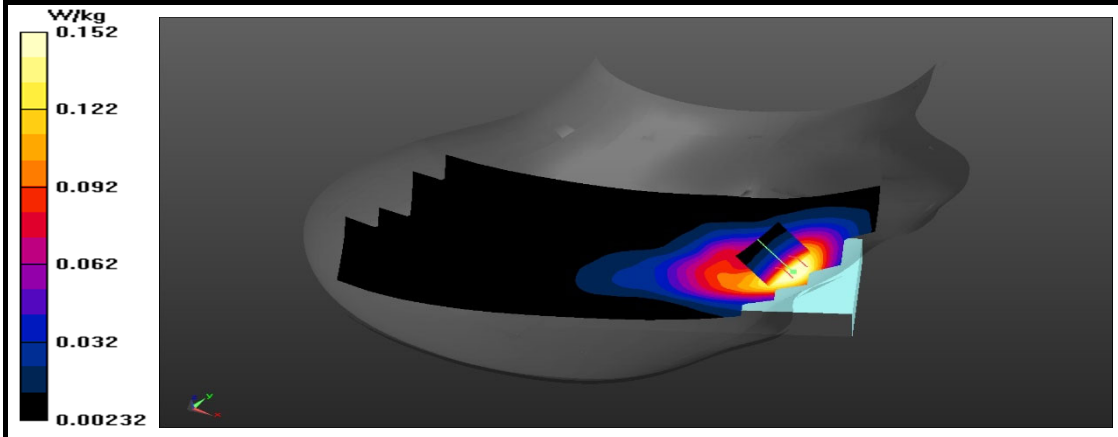


Figure 28: SAR Head Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.2 °C
DATE:	24/09/2019	**RELATIVE HUMIDITY:**	39.6 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	0.823 S/m
DUT CONFIGURATION:	Antenna-300-01931-1880mAh Battery	**RELATIVE PERMITTIVITY:**	44.187
DUT POSITION:	Right - Tilt	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	-0.20 dB
MODULATION:	DSSS	**PEAK SAR:**	0.01 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.01 W/kg

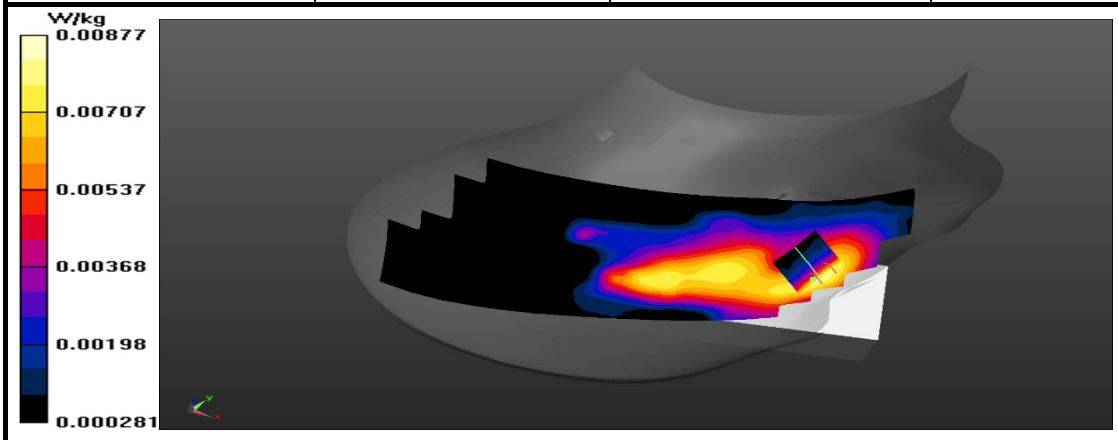


Figure 29: SAR Head Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.2 °C
DATE:	24/09/2019	**RELATIVE HUMIDITY:**	39.6 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	1.928 S/m
DUT CONFIGURATION:	Antenna-300-01960-1880mAh Battery	**RELATIVE PERMITTIVITY:**	39.455
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	-0.02 dB
MODULATION:	DSSS	**PEAK SAR:**	0.34 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.23 W/kg

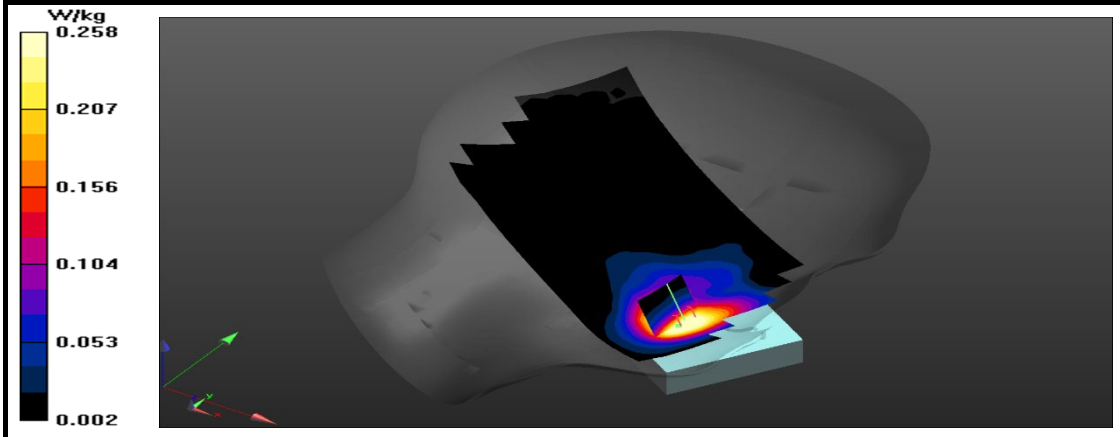


Figure 30 SAR Head Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.7 °C
DATE:	24/09/2019	**RELATIVE HUMIDITY:**	35.1 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	1.928 S/m
DUT CONFIGURATION:	Antenna-310-00015-1880mAh Battery	**RELATIVE PERMITTIVITY:**	39.455
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.9 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	-0.18 dB
MODULATION:	DSSS	**PEAK SAR:**	0.33 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.22 W/kg

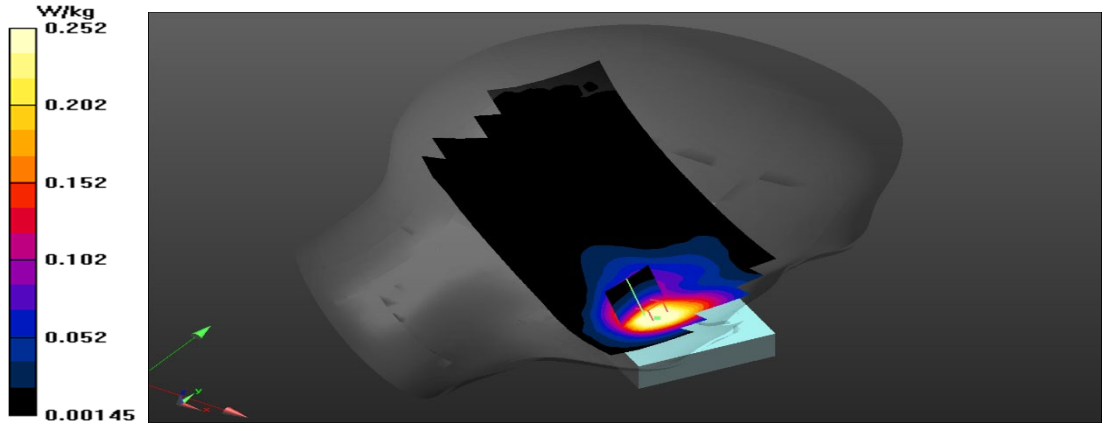


Figure 31: SAR Head Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.5 °C
DATE:	25/09/2019	**RELATIVE HUMIDITY:**	42.6 %
PHANTOM:	QD 000 P40 CD	**CONDUCTIVITY:**	1.928 S/m
DUT CONFIGURATION:	Antenna-300-01931-1160mAh Battery	**RELATIVE PERMITTIVITY:**	39.455
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	22.0 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	-0.01 dB
MODULATION:	DSSS	**PEAK SAR:**	0.32 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.23 W/kg

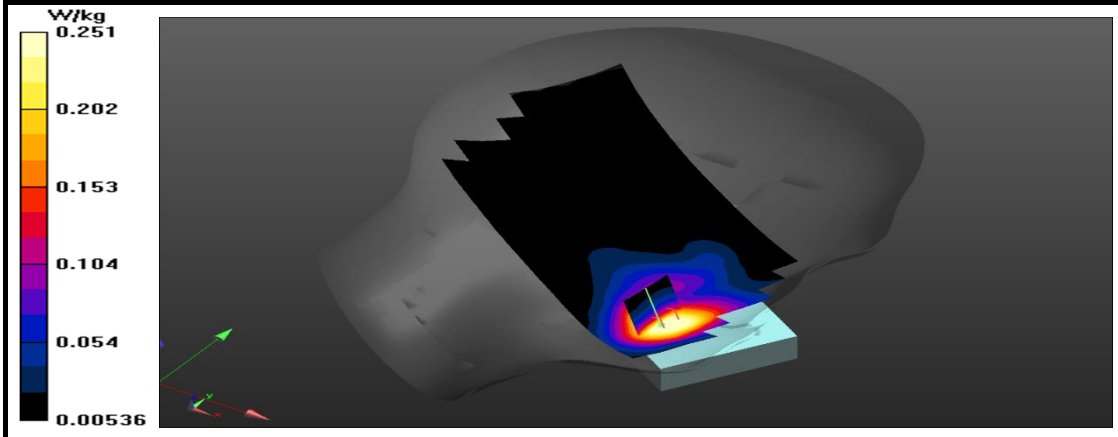


Figure 32: SAR Head Testing Results for the SC2124 at 2462 MHz.

2.6 TETRA 450 MHz - BODY SAR TEST RESULTS

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.912 S/m
DUT CONFIGURATION:	Antenna-300-01931-1160mAh Battery – holster 300-01917	**RELATIVE PERMITTIVITY:**	55.119
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	430 MHz	**DRIFT:**	0.04 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.04 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.70 W/kg

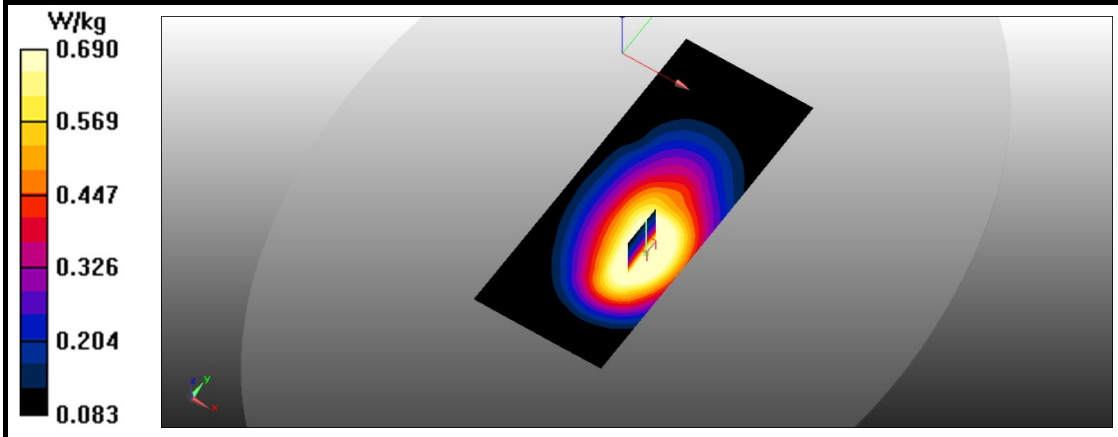


Figure 33: SAR Body Testing Results for the SC2124 at 430 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.912 S/m
DUT CONFIGURATION:	Antenna-300-01931-1160mAh Battery – holster 300-01915(leather)	**RELATIVE PERMITTIVITY:**	55.119
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	430 MHz	**DRIFT:**	-0.08 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.89 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.72 W/kg

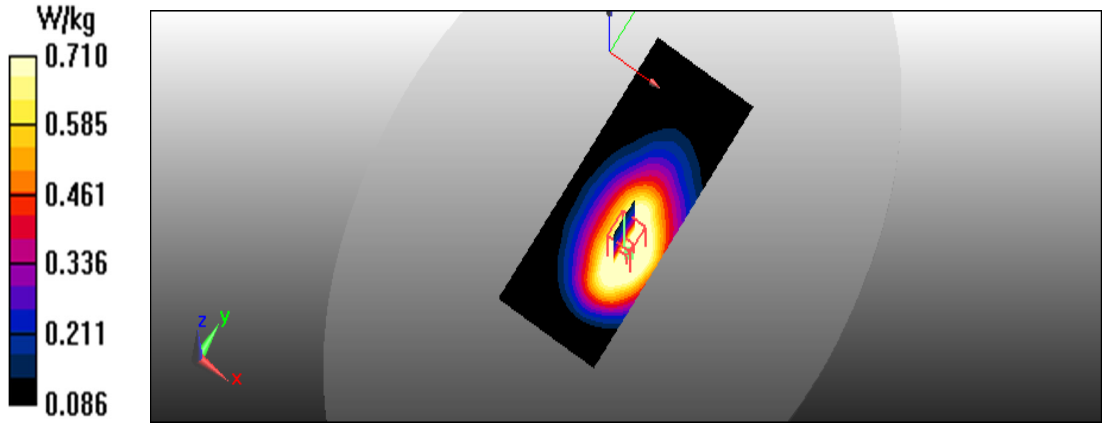


Figure 34: SAR Body Testing Results for the SC2124 at 430 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	32.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.912 S/m
DUT CONFIGURATION:	Antenna-300-01931-1160mAh Battery - large clip	**RELATIVE PERMITTIVITY:**	55.119
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	430 MHz	**DRIFT:**	0.15 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.68 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.50 W/kg

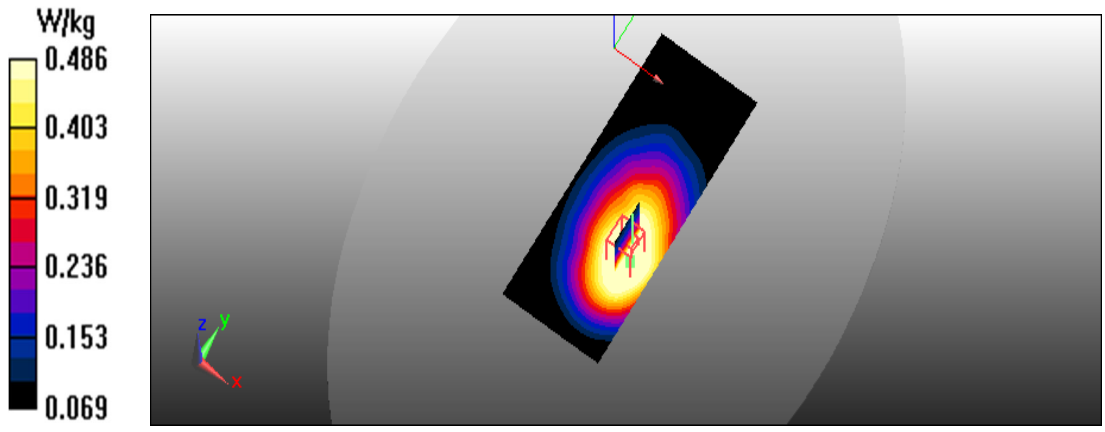


Figure 35: SAR Body Testing Results for the SC2124 at 430 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	32.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.912 S/m
DUT CONFIGURATION:	Antenna-300-01931-1160mAh Battery - small clip	**RELATIVE PERMITTIVITY:**	55.119
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	430 MHz	**DRIFT:**	-0.19 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.92 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.71 W/kg

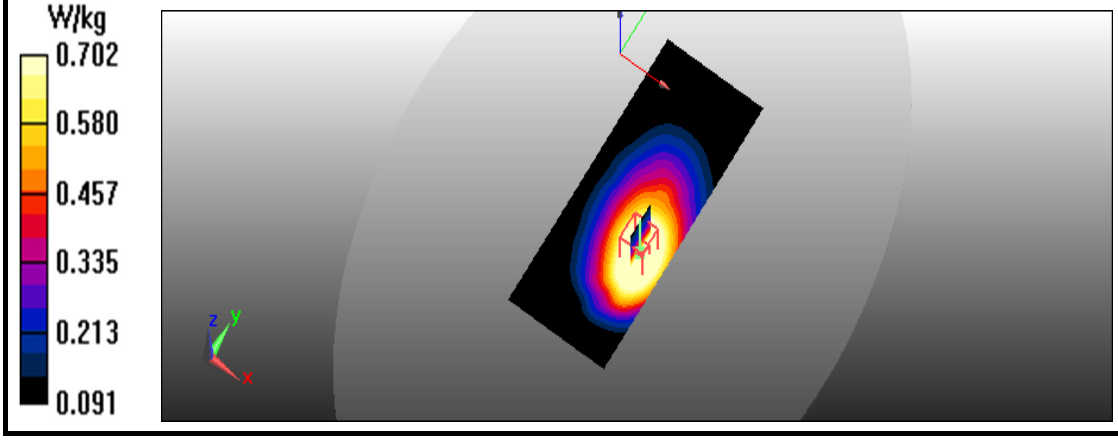


Figure 36: SAR Body Testing Results for the SC2124 at 430 MHz

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	32.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.912 S/m
DUT CONFIGURATION:	Antenna-300-01931-1160mAh Battery - holster 300-01916(nylon)	**RELATIVE PERMITTIVITY:**	55.119
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	430 MHz	**DRIFT:**	-0.09 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.08 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.79 W/kg

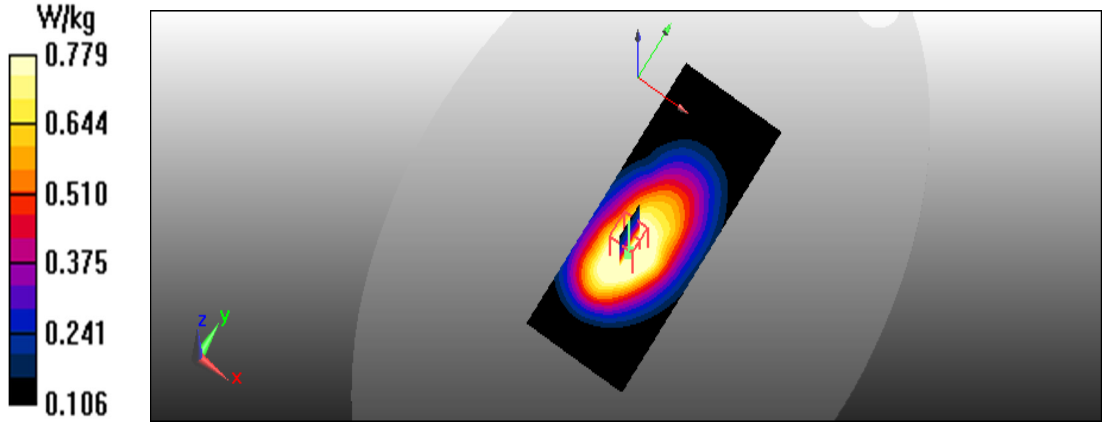


Figure 37: SAR Body Testing Results for the SC2124 at 430 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.945 S/m
DUT CONFIGURATION:	Antenna-300-01960-1160mAh Battery - holster 300-01917(click fast)	**RELATIVE PERMITTIVITY:**	54.342
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.05 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.67 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.52 W/kg

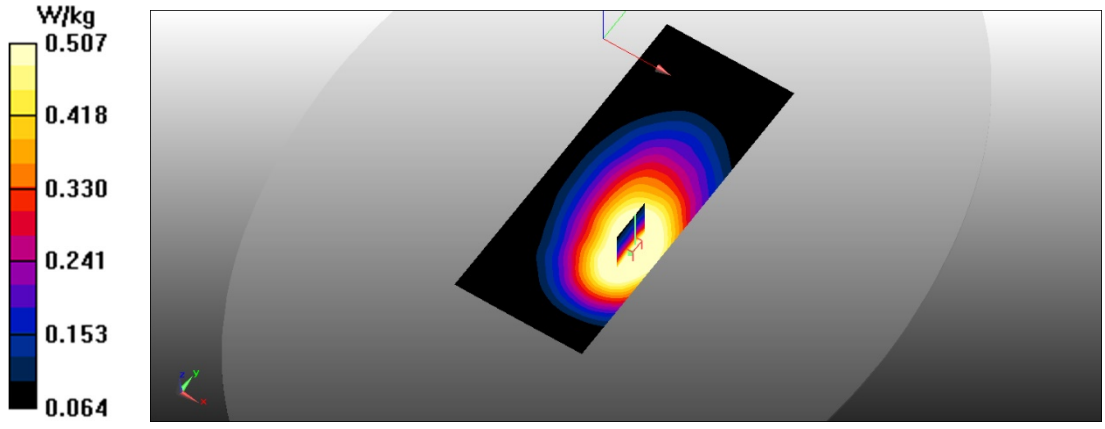


Figure 38: SAR Body Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.945 S/m
DUT CONFIGURATION:	Antenna-300-01960-1160mAh Battery - holster 300-01915(leather)	**RELATIVE PERMITTIVITY:**	54.342
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.11 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.78 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.57 W/kg

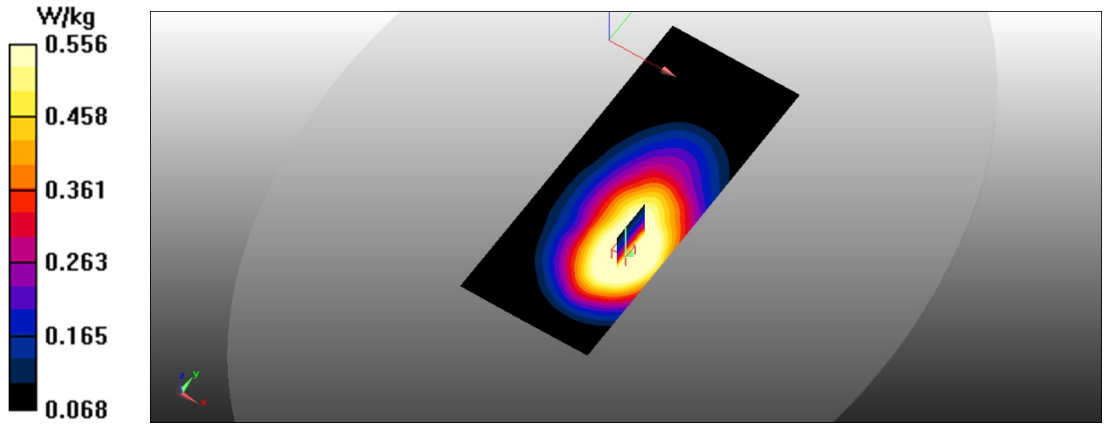


Figure 39: SAR Body Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.912 S/m
DUT CONFIGURATION:	Antenna-300-01960-1160mAh Battery - holster 300-01916(nylon)	**RELATIVE PERMITTIVITY:**	55.119
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.18 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.95 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.68 W/kg

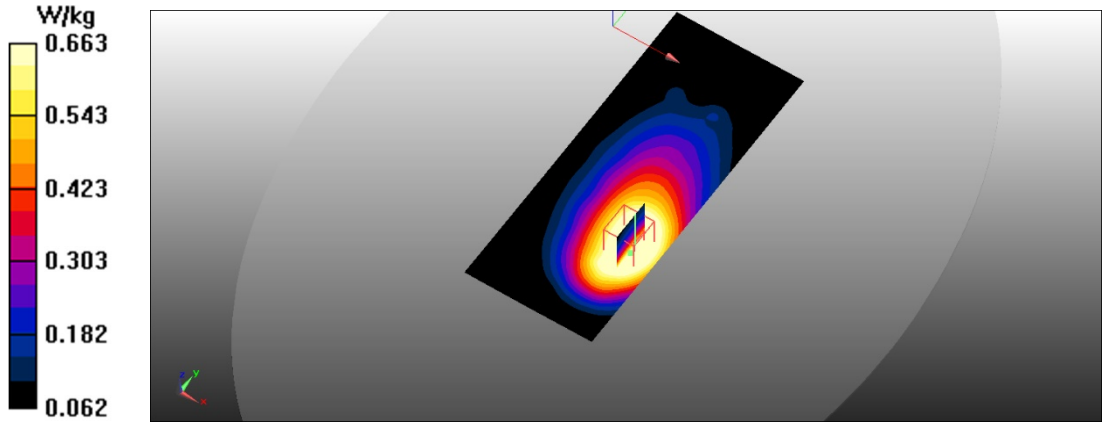


Figure 40: SAR Body Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.945 S/m
DUT CONFIGURATION:	Antenna-300-01960-1160mAh Battery - small clip	**RELATIVE PERMITTIVITY:**	54.342
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.00 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.86 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.62 W/kg

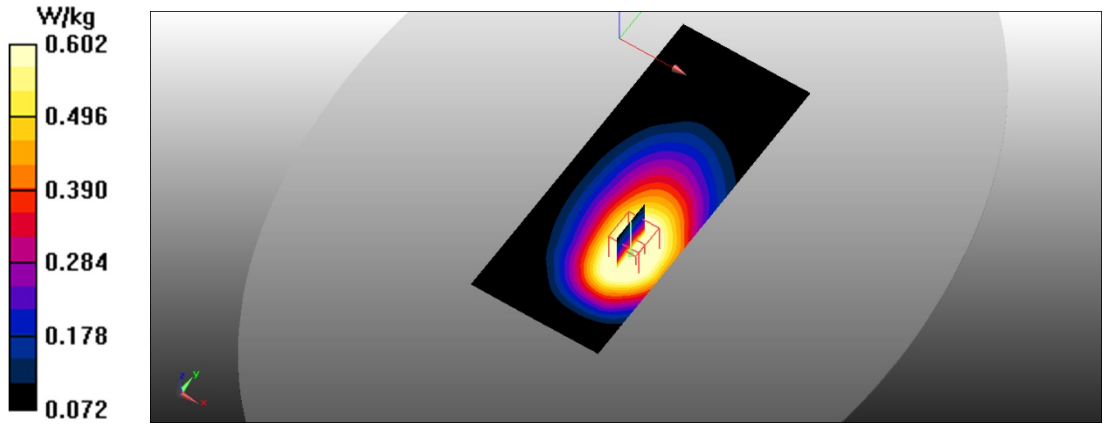


Figure 41: SAR Body Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.945 S/m
DUT CONFIGURATION:	Antenna-300-01960-1160mAh Battery - large clip	**RELATIVE PERMITTIVITY:**	54.342
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.18 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	0.55 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.42 W/kg

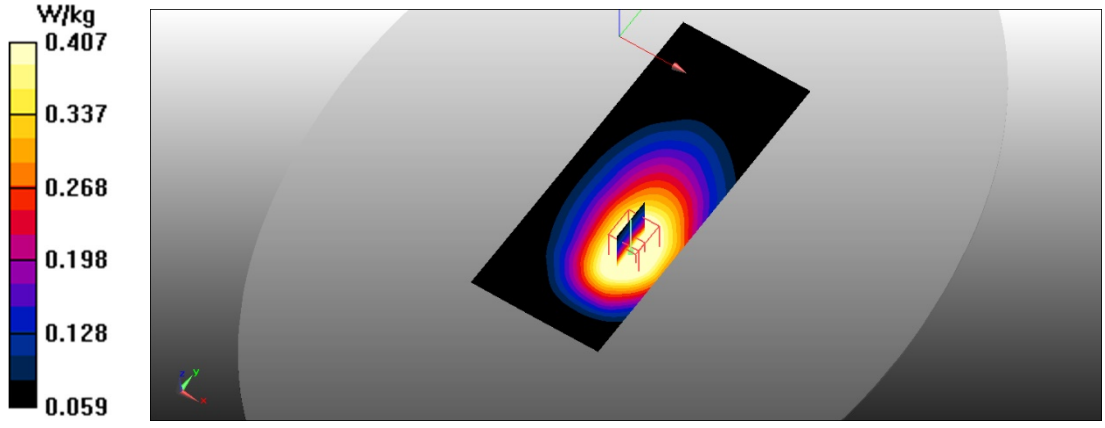


Figure 42: SAR Body Testing Results for the SC2124 at 470 MHz

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.945 S/m
DUT CONFIGURATION:	Antenna-310-00015-1160mAh Battery - holster 300-01917(click fast)	**RELATIVE PERMITTIVITY:**	54.342
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.10 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.55 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.16 W/kg

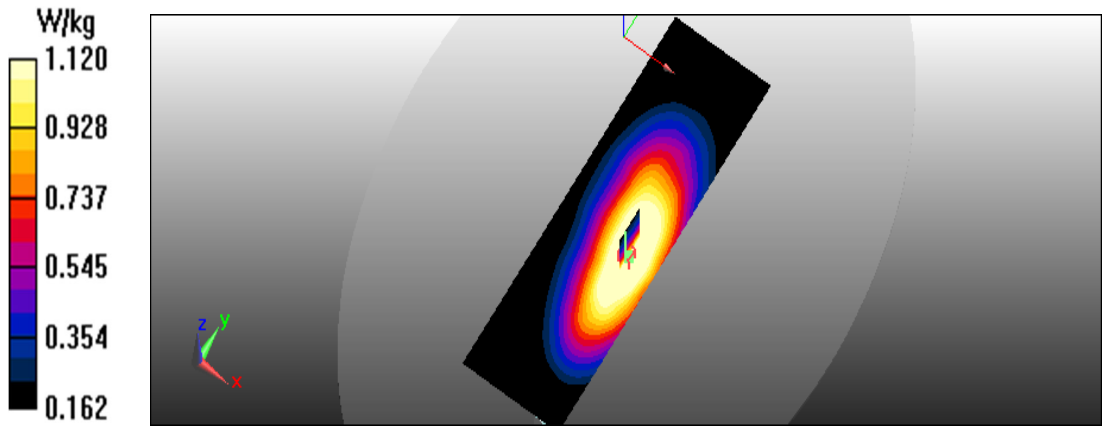


Figure 43: SAR Body Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.945 S/m
DUT CONFIGURATION:	Antenna-310-00015-1160mAh Battery - holster 300-01915(leather)	**RELATIVE PERMITTIVITY:**	54.342
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.03 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.48 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.15 W/kg

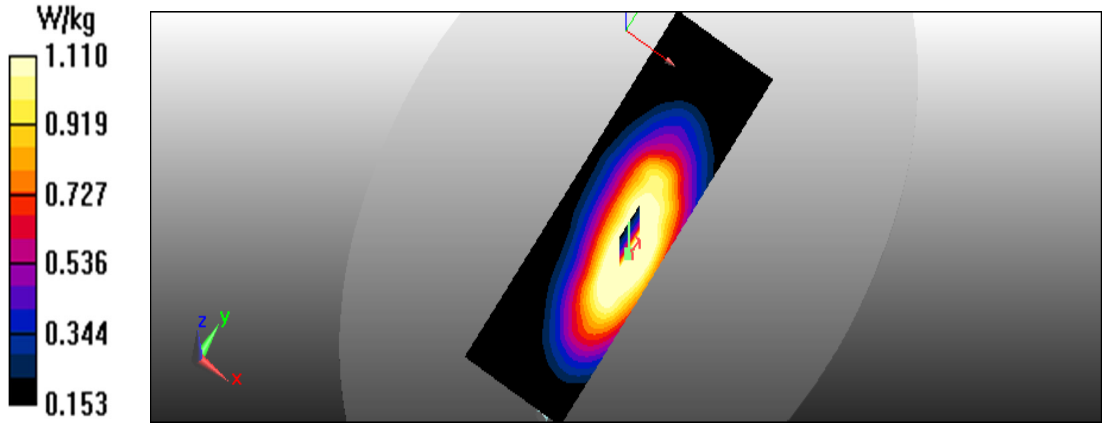


Figure 44: SAR Body Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.945 S/m
DUT CONFIGURATION:	Antenna-310-00015-1160mAh Battery - large clip	**RELATIVE PERMITTIVITY:**	54.342
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.05 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.06 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	0.83 W/kg

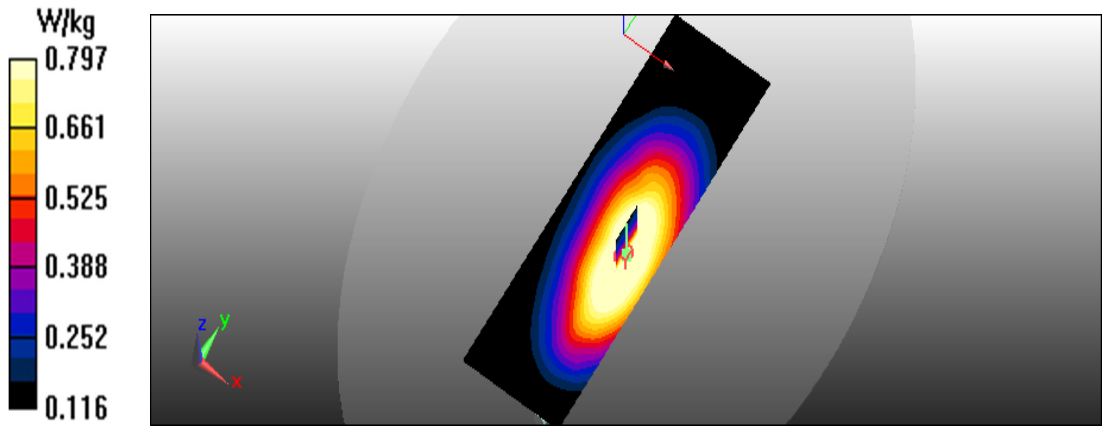


Figure 45: SAR Body Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.945 S/m
DUT CONFIGURATION:	Antenna-310-00015-1160mAh Battery - small clip	**RELATIVE PERMITTIVITY:**	54.342
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	0.16 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.58 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.17 W/kg

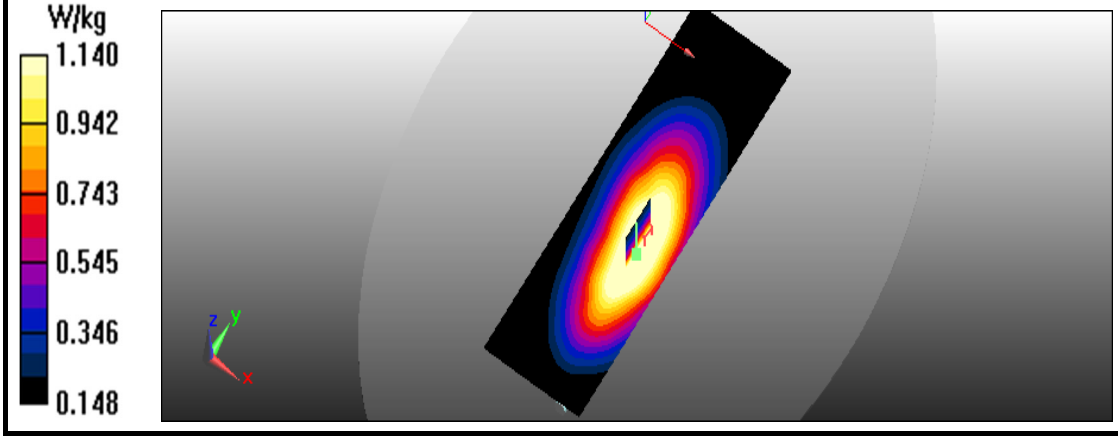


Figure 46: SAR Body Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	33.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.945 S/m
DUT CONFIGURATION:	Antenna-310-00015-1160mAh Battery - holster 300-01916(nylon)	**RELATIVE PERMITTIVITY:**	54.342
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.09 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	2.01 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.48 W/kg

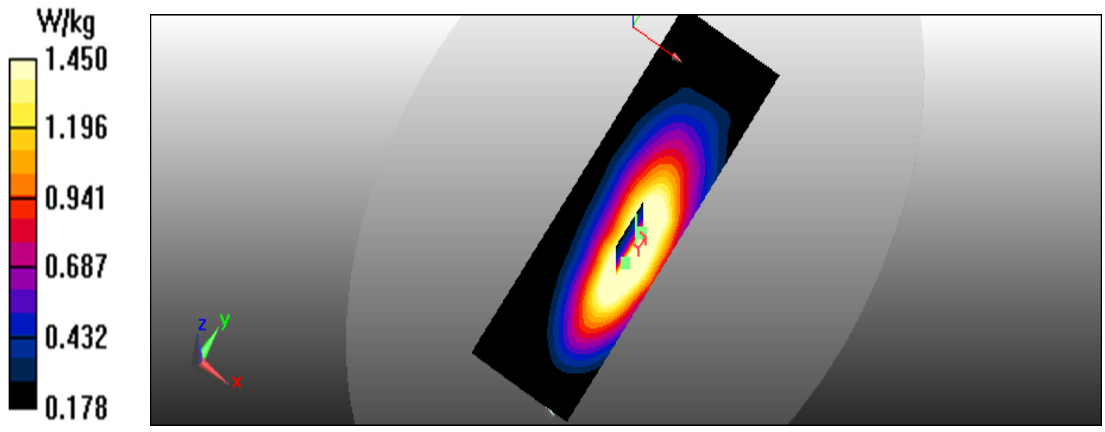


Figure 47: SAR Body Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.7 °C
DATE:	28/11/2019	**RELATIVE HUMIDITY:**	43.5 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.959 S/m
DUT CONFIGURATION:	Antenna-310-00015-1160mAh Battery - holster 300-01916(nylon) RSM attached	**RELATIVE PERMITTIVITY:**	54.888
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21 8°C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.03 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.52 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.24 W/kg

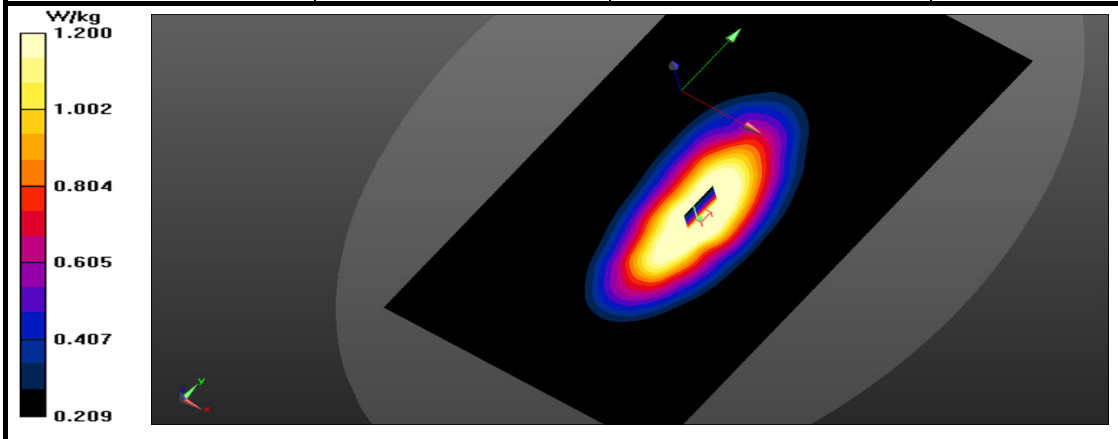


Figure 48: SAR Body Testing Results for the SC2124 at 470 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	22.0 °C
DATE:	30/05/2019	**RELATIVE HUMIDITY:**	32.2 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	0.945 S/m
DUT CONFIGURATION:	Antenna-310-00015-1880mAh Battery - holster 300-01916(nylon)	**RELATIVE PERMITTIVITY:**	54.342
DUT POSITION:	0mm - Rear Facing	**LIQUID TEMPERATURE:**	21 °C
RAT:	TETRA	**SCAN TYPE:**	Full
FREQUENCY:	470 MHz	**DRIFT:**	-0.07 dB
MODULATION:	π/4DQPSK	**PEAK SAR:**	1.39 W/kg
DUTY CYCLE:	25 %	**SAR (1g):**	1.01 W/kg

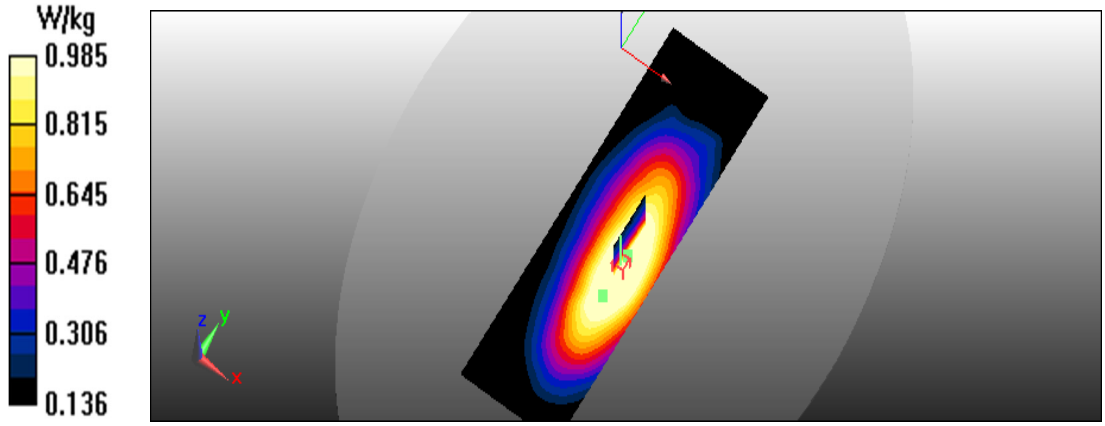


Figure 49: SAR Body Testing Results for the SC2124 at 470 MHz.

2.7 WLAN 2450 MHz - 802.11b 20MHz 1Mbps - BODY SAR TEST RESULTS

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	23.2 °C
DATE:	12/09/2019	**RELATIVE HUMIDITY:**	52.4 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	1.976 S/m
DUT CONFIGURATION:	Antenna-300-01960-1160mAh Battery - holster 300-01916(nylon)	**RELATIVE PERMITTIVITY:**	52.331
DUT POSITION:	0mm - Rear Face	**LIQUID TEMPERATURE:**	22.2 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	-0.14 dB
MODULATION:	DSSS	**PEAK SAR:**	0.26 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.19 W/kg

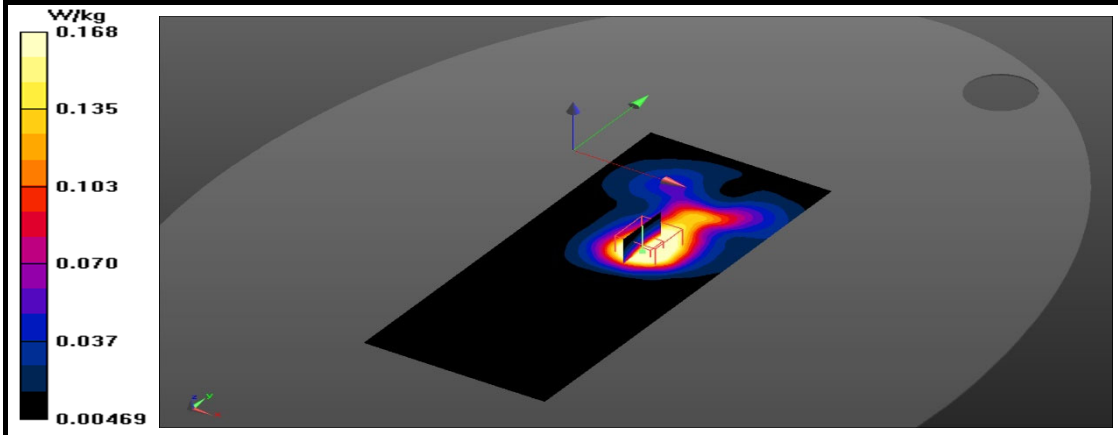


Figure 50: SAR Body Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	23.2 °C
DATE:	12/09/2019	**RELATIVE HUMIDITY:**	52.4 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	1.976 S/m
DUT CONFIGURATION:	Antenna-300-01931-1160mAh Battery - holster 300-01916(nylon)	**RELATIVE PERMITTIVITY:**	52.331
DUT POSITION:	0mm - Rear Face	**LIQUID TEMPERATURE:**	22.2 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	-0.10 dB
MODULATION:	DSSS	**PEAK SAR:**	0.25 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.18 W/kg

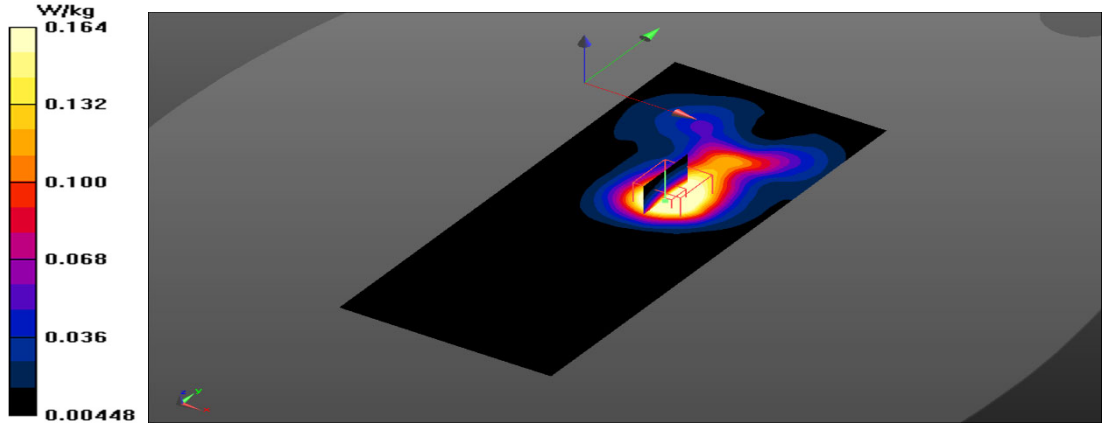


Figure 51: SAR Body Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	23.2 °C
DATE:	12/09/2019	**RELATIVE HUMIDITY:**	52.4 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	1.976 S/m
DUT CONFIGURATION:	Antenna-310-00015-1160mAh Battery - holster 300-01916(nylon)	**RELATIVE PERMITTIVITY:**	52.331
DUT POSITION:	0mm - Rear Face	**LIQUID TEMPERATURE:**	22.2 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	-0.09 dB
MODULATION:	DSSS	**PEAK SAR:**	0.25 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.18 W/kg

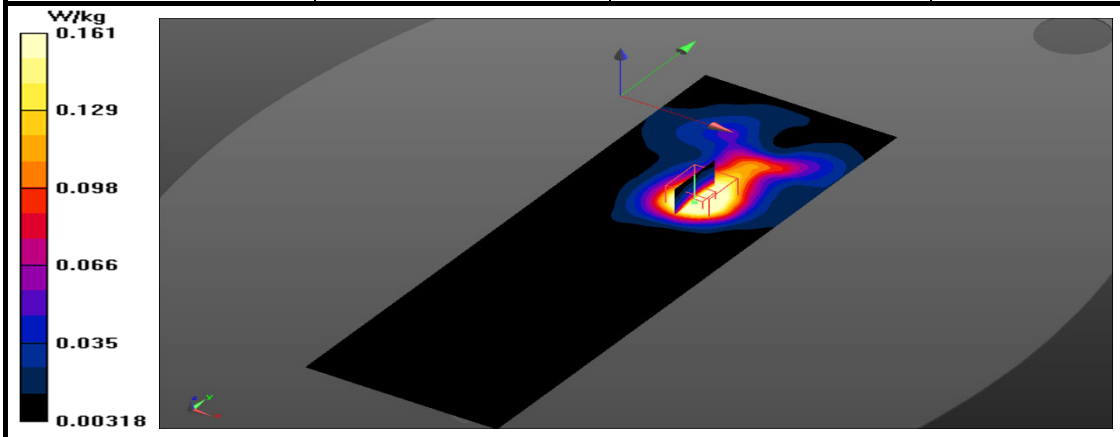


Figure 52: SAR Body Testing Results for the SC2124 at 2462 MHz.

SOFTWARE VERSION:	52.10.2(1495)	**AMBIENT TEMPERATURE:**	23.2 °C
DATE:	12/09/2019	**RELATIVE HUMIDITY:**	52.4 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	1.976 S/m
DUT CONFIGURATION:	Antenna-300-01960-1880mAh Battery - holster 300-01916(nylon)	**RELATIVE PERMITTIVITY:**	52.331
DUT POSITION:	0mm - Rear Face	**LIQUID TEMPERATURE:**	22.2 °C
RAT:	WLAN	**SCAN TYPE:**	Full
FREQUENCY:	2462 MHz	**DRIFT:**	-0.10 dB
MODULATION:	DSSS	**PEAK SAR:**	0.24 W/kg
DUTY CYCLE:	100 %	**SAR (1g):**	0.18 W/kg

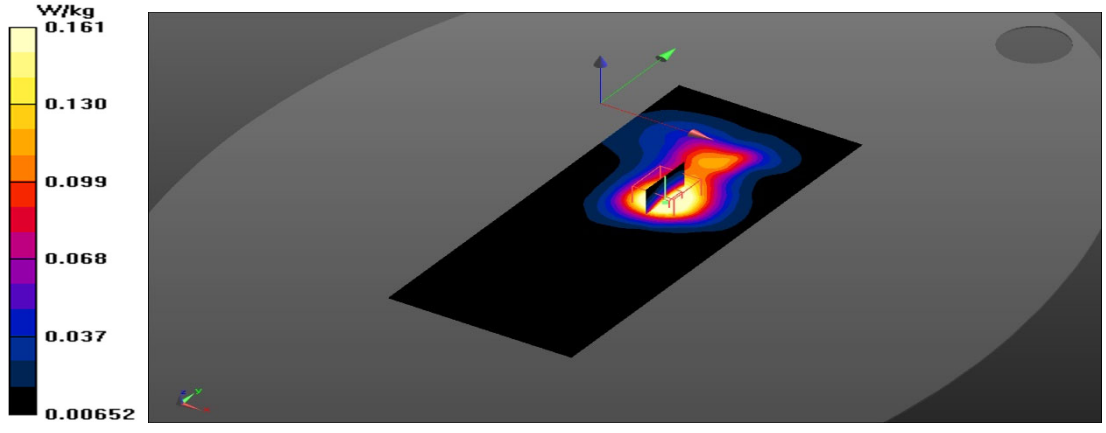


Figure 53: SAR Body Testing Results for the SC2124 at 2462 MHz.

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

The following test equipment was used at TÜV SÜD for testing
Period 10-05-2019 to 30-05-2019:

Instrument Description	Manufacturer	Model Type	TE Number	Cal Period (months)	Calibration Due Date
10MHz - 2.5GHz, 3W, Amplifier	Vectawave Technology	VTL5400	51	-	TU
Signal Generator	Hewlett Packard	ESG4000A	61	12	20-Jul-2019
Attenuator (30dB, 25W)	Weinschel	46-30-34	2776	12	16-Jul-2019
Bi-directional Coupler	IndexSar Ltd	7401 (VDC0830-20)	2414	-	TU
Thermometer	Digitron	T208	64	12	23-May-2019*
Thermometer	Fluke	51	3172	12	07-Dec-2019
Hygrometer	Rotronic	I-1000	3068	12	21-June-2019
Power Sensor	Rohde & Schwarz	NRV- Z1	178	12	08-Jun-2019
Power Sensor	Rohde & Schwarz	NRV- Z1	3563	12	08-Jun-2019
Dual Channel Power Meter	Rohde & Schwarz	NRVD	2979	12	08-Jun-2019
P Series Power Meter	Agilent	N1911A	3980	12	9-Oct-2019
Power Sensor	Agilent	N1921A	3982	12	9-Oct-2019
Data Acquisition Electronics	Speag	DAE 4 - SD 000 D04 BM	4689	12	25-Mar-2020
Measurement Server	Speag	DASY 5 Measurement Server	4692	-	TU
Elliptical Phantom	Speag	ELI Phantom	4699	-	TU
SAM Phantom	Speag	SAM Phantom	4703	-	TU
Dosimetric SAR Probe	Speag	EX3DV4	4700	12	13-Dec-2019
Mounting Platform for TX90XL Robot and Phantoms	Speag	MP6C-TX90XL Mounting Platform Extended	4702	-	TU
Robot	Stäubli	TX90 XL Robot	4704	-	TU
Device Holder	Speag	MD4HHTV5	3870	-	TU
450 MHz Dipole	Speag	D450V3	4695	12	07-Dec-2019
HSL450 Fluid	Speag	Batch 1	N/A	Weekly	03-Jun-2019
MSL450 Fluid	Speag	Batch 1	N/A	Weekly	03-Jun-2019

TU = Traceability Unscheduled
* Calibration Expired Mid Testing. Instrument replaced with TE3172

The following test equipment was used at TÜV SÜD for testing
Period 12-09-2019 to 28-11-2019:

Instrument Description	Manufacturer	Model Type	TE Number	Cal Period (months)	Calibration Due Date
10MHz - 2.5GHz, 3W, Amplifier	Vectawave Technology	VTL5400	51	-	TU
Signal Generator	Hewlett Packard	ESG4000A	61	12	17-Jul-2020
Attenuator (30dB, 25W)	Weinschel	46-30-34	2776	12	23-Jul-2020
Bi-directional Coupler	IndexSar Ltd	7401 (VDC0830-20)	2414	-	TU
Thermometer	Digitron	T208	64	12	12-Jun-2020
Hygrometer	Rotronic	I-1000	3068	12	27-June-2020
Power Sensor	Rohde & Schwarz	NRV- Z1	178	12	07-Jun-2020
Power Sensor	Rohde & Schwarz	NRV- Z1	3563	12	02-Jun-2020
Dual Channel Power Meter	Rohde & Schwarz	NRVD	2979	12	07-Jun-2020
Data Acquisition Electronics	Speag	DAE 4 - SD 000 D04 BM	4689	12	25-Mar-2020
Measurement Server	Speag	DASY 5 Measurement Server	4692	-	TU
Elliptical Phantom	Speag	ELI Phantom	4699	-	TU
SAM Phantom	Speag	SAM Phantom	4703	-	TU
Dosimetric SAR Probe	Speag	EX3DV4	4700	12	13-Dec-2019
Mounting Platform for TX90XL Robot and Phantoms	Speag	MP6C-TX90XL Mounting Platform Extended	4702	-	TU
Robot	Stäubli	TX90 XL Robot	4704	-	TU
Device Holder	Speag	MD4HHTV5	3870	-	TU
450 MHz Dipole	Speag	D450V3	4695	12	07-Dec-2019
2450 MHz Dipole	Speag	D2450V2	3875	12	11-Dec-2019
MSL450 Fluid	Speag	Batch 1	N/A	Weekly	02-Dec-2019
HBBL Fluid	Speag	Batch 1	N/A	Weekly	02-Dec-2019
MBBL Fluid	Speag	Batch 1	N/A	Weekly	02-Dec-2019

TU = Traceability Unscheduled

3.2 TEST SOFTWARE

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

Instrument	Version Number
DASY system	52.10.2(1495)

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 are as follows: -

Fluid Type and Frequency	Relative Permittivity Target (ε_r)	Relative Permittivity Measured (ε_r)	Conductivity Target (σ)	Conductivity Measured (σ)	Date	Fluid Temperature °C
450 MHz Head (HSL450)	43.50	44.80	0.87	0.87	09-05-19	21.8
450 MHz Head (HSL450)	43.50	43.34	0.87	0.86	28-05-19	21.1
450 MHz Body (MSL450)	54.70	55.37	0.94	0.93	28-05-19	21.9
2450 MHz Body (MBBL-B2)	52.35	1.97	52.7	1.95	06-09-19	20.6
2450 MHz Head (HBBL-B1)	39.20	40.27	1.80	1.83	23-09-19	21.6
450 MHz Body (MSL450)	56.70	55.25	0.94	0.94	28-05-19	21.9

3.4 TEST CONDITIONS

3.4.1 Test Laboratory Conditions

Ambient temperature: Within +15°C to +35°C.
The actual temperature during the testing ranged from 22.0°C to 24.0°C.
The actual humidity during the testing ranged from 26.8% to 52.4% RH.

3.4.2 Test Fluid Temperature Range

Frequency	Body / Head Fluid	Min Temperature °C	Max Temperature °C
450 MHz	Head	21.9	21.9
450 MHz	Body	21.0	21.8
2450 MHz	Head	21.9	22.0
2450 MHz	Body	22.2	22.2

3.4.3 SAR Drift

The maximum SAR Drift was recorded as 0.21 dB for head and 0.19 dB for body. The measurement uncertainty budget for this assessment includes the maximum SAR Drift figures.

3.5 MEASUREMENT UNCERTAINTY

Head, 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	

Body, 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	