

SAR Test Report

Part 1 of 3

Project Number: 4942239**Quotation Number:** SUW-202112002041**Report Number:** 4942239EMC05.1**Revision Level:** 1**Client:** Riskband LLC**Equipment Under Test:** Wearable Emergency Device**Host Model Name:** ARIES**Host Model Number:** RBD30060**Host FCC ID:** 2AHZ7-300602022**Host IC:** 21986-300602022**Module FCC ID:** 2AHZ7-R20082B00**Module IC:** 21986-R20082B00**Applicable Standards:** IEC 62209-1528**Report issued on:** 15 November 2022**Test Result:** Compliant

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER: 3212.01

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Tested / Evaluated by:
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TABLE O1F CONTENTS

1	SUMMARY OF RESULTS.....	3
2	GENERAL INFORMATION	4
2.1	CLIENT INFORMATION.....	4
2.2	TEST LABORATORY	4
2.3	GENERAL INFORMATION OF EUT	4
2.4	TX FREQUENCY BANDS.....	5
2.5	EQUIPMENT UNDER TEST.....	5
2.6	ANTENNA LOCATION.....	6
2.7	TEST METHODOLOGY AND REFERENCED STANDARDS AND GUIDELINES	6
3	TEST EQUIPMENT AND MEASUREMENT SYSTEM.....	7
3.1	TEST EQUIPMENT	7
3.2	MEASUREMENT SYSTEM BLOCK DIAGRAM.....	8
3.3	MEASUREMENT SYSTEM PHANTOM DESCRIPTIONS	9
3.4	MEASUREMENT SYSTEM TISSUE DESCRIPTION	9
4	SYSTEM VALIDATIONS AND VERIFICATIONS.....	9
4.1	SYSTEM VALIDATIONS	9
4.2	SYSTEM VERIFICATIONS	10
4.3	TISSUE MEASUREMENT RESULTS	11
5	ENVIRONMENTAL CONDITIONS	12
6	MEASUREMENT PROCEDURES.....	12
6.1	HEAD CONFIGURATION.....	12
6.2	BODY-WORN CONFIGURATION	12
6.3	LIMB-WORN CONFIGURATION	12
6.4	SAR PROCEDURES SETUP	13
7	LTE OUTPUT POWER MEASUREMENTS	14
7.1	LTE BAND 2 (1850-1910 MHz).....	14
7.2	LTE BAND 4 (1710-1755 MHz).....	15
7.3	LTE BAND 5 (824-849 MHz)	16
7.4	LTE BAND 12 (699-716 MHz)	17
8	WLAN OUTPUT POWER MEASUREMENTS.....	18
9	BT OUTPUT POWER MEASUREMENTS	18
10	BLE OUTPUT POWER MEASUREMENTS	19
11	SAR RESULTS.....	20
11.1	LTE BAND 2 (1850-1910 MHz).....	21
11.2	LTE BAND 4 (1710-1755 MHz).....	21
11.3	LTE BAND 5 (824-849 MHz)	21
11.4	LTE BAND 12 (699-716 MHz)	21
11.5	WLAN 2.4GHZ.....	22
11.6	BLUETOOTH CLASSIC	22
12	VARIABILITY ASSESSMENT.....	22

13	SIMULTANEOUS TRANSMISSION.....	23
14	SYSTEM UNCERTAINTY	23
15	REVISION HISTORY	24

1 SUMMARY OF RESULTS

RF Exposure Conditions	General Population/Uncontrolled		Compliance to RSS – 102, FCC 2.1093
	Localized SAR 1g (Head and Body)	Localized SAR 10g (Extremities)	
	1.6 W/kg	NA	

Equipment Class	Band	Highest SAR values (W/kg)				
		Head		Body		Extremity
		1g	10g	1g	10g	10g
PCB	LTE Band 2 1850-1910 MHz	NA	NA	1.20	NA	NA
PCB	LTE Band 4 1710-1755 MHz	NA	NA	0.76	NA	NA
PCB	LTE Band 5 824-849 MHz	NA	NA	0.57	NA	NA
PCB	LTE Band 12 699-716 MHz	NA	NA	0.51	NA	NA
DSS	Bluetooth 2402-2480 MHz	NA	NA	0.00	NA	NA
DTS	WLAN 2401-2495 MHz	NA	NA	0.00	NA	NA
Simultaneous Results		NA	NA	1.20	NA	NA

2 GENERAL INFORMATION

2.1 CLIENT INFORMATION

Name: Riskband LLC
Address: 1000 Johnnie Dodds Blvd., Suite 103-312
City, State, Zip, Country: Mt. Pleasant, South Carolina, 29464, USA

2.2 TEST LABORATORY

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

2.3 GENERAL INFORMATION OF EUT

Equipment Under Test: Wearable Emergency Device
Host Model Name: ARIES
Host Model Number: RBD30060
Hardware Version: 3.5.1
Software Version: NA
Firmware Version: 350
Sample ID Number: SAR Radiated:

221003-00001
221003-00002
221003-00003
221003-00004
220924-00003

Conducted:
220512-00013

Frequencies of Operation: 1850 – 1910 MHz (LTE Band 2)
1710 – 1755 MHz (LTE Band 4)
824 – 849 MHz (LTE Band 5)
699 – 716 MHz (LTE Band 12)

LTE Uplink Modulations: QPSK, 16QAM
Bluetooth Modulations: $\pi/4$ DQPSK, 8DPSK
WLAN: DSSS, OFDM
Maximum Conducted Power: See Section 2.4 of this report

Battery Model: CND-783287P (Shenzhen Chanda Energy Co., Ltd.)
Bluetooth/WLAN Antenna Model: A5839 (Antenova)
*Antenna Gain: 2.4GHz: 2.1 dBi
Cellular Antenna Model: P822601 (Ethertronics)
*Antenna Gain: Band 2: 4.4 dBi
Band 4: 4.4 dBi
Band 5: 2.6 dBi
Band 12: 2.6 dBi

Dates of testing: 14-20 October 2022

**Data was not measured by SGS laboratory and therefore not responsible for accuracy. Data obtained via customer, specification sheet, previous regulatory filing or other.*

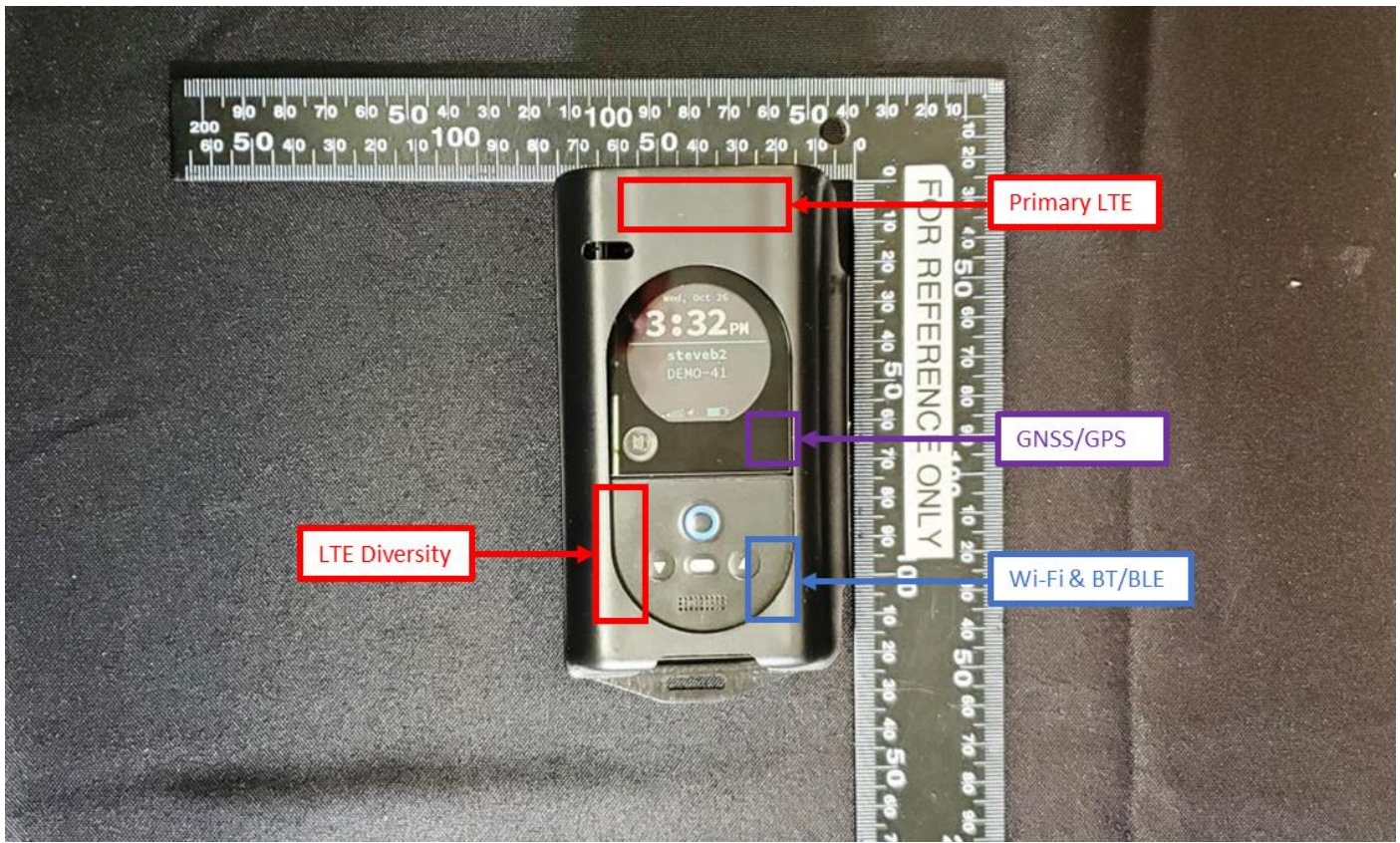
2.4 TX FREQUENCY BANDS

Band / Mode		Maximum Power dBm	Frequency Range MHz	Channel Bandwidths MHz
Band 2	LTE	21.86	1850 to 1910	1.4, 3, 5, 10, 15, 20
Band 4	LTE	22.24	1710 to 1755	1.4, 3, 5, 10, 15, 20
Band 5	LTE	23.21	824 to 849	1.4, 3, 5, 10
Band 12	LTE	22.0	699 to 716	1.4, 3, 5, 10
WLAN 2.4GHz	802.11 b/g/n	22.09	2401 to 2495	22, 20
Bluetooth Classic	GFSK/8DPSK	11.35	2400 to 2483	1
Bluetooth LE	GFSK (1M Data Rates)	8.5	2402bt to 2480	2

2.5 EQUIPMENT UNDER TEST

Device Description	Wearable Emergency Device
Device Category	Portable
Stage of production	Pre-production unit
Intended Use	EUT is worn on the body with holster
Antennas	BLE/WLAN: A5839 (Antenova) LTE: P822601 (Ethertronics)
Battery	CND-783287P (Shenzhen Chanda Energy Co., Ltd.)
Optional Accessories	Holster

2.6 ANTENNA LOCATION



2.7 TEST METHODOLOGY AND REFERENCED STANDARDS AND GUIDELINES

Tests were conducted in accordance with the following applicable standards and guidelines.

IEC62209-1528 Edition 1.0 2020-10, Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices –

Part 1528: Human models, instrumentation, and procedures
(Frequency Range of 4 MHz to 10 GHz)

Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, FCC, Washington, D.C.: 1997.

RSS – 102 Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus

FCC KDB – 447498 D01 General RF Exposure Guidance v06

FCC KDB – 941225 D05 SAR for LTE Devices v02r05

FCC KDB – 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04

FCC KDB – 248227 D01 802.11 WiFi SAR v02r02

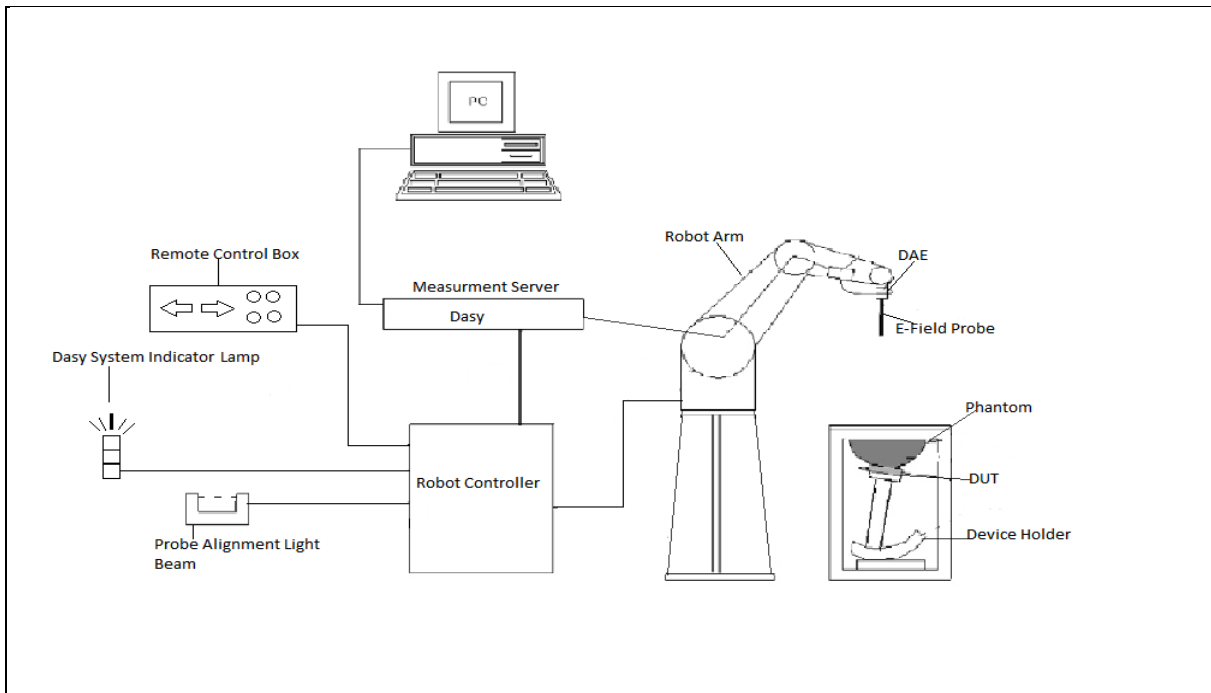
FCC KDB – 996369 D01 Module Equip Auth Guide v02

3 TEST EQUIPMENT AND MEASUREMENT SYSTEM

3.1 TEST EQUIPMENT

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
SIGNAL GENERATOR (TS8997)	SMB 100A	ROHDE & SCHWARZ	B094876	30-Nov-2020	30-Nov-2023
POWER METER	E4419B	AGILENT	B079628	22-Sep-2021	30-Nov-2022
POWER SENSOR	8481A	AGILENT	B079679	22-Sep-2021	30-Nov-2022
POWER SENSOR	8481A	AGILENT	B086132	29-Sep-2021	30-Nov-2022
DIRECTIONAL COUPLER	778D	HEWLETT PACKARD	B087456	28-Jul-2020	28-Jul-2023
ATTENUATOR, 20DB 100W	BW-20N100W+	MINI-CIRCUITS	20143	16-Mar-2022	16-Mar-2023
ATTENUATOR, 10DB	BW-N10W20+	MINI-CIRCUITS	17023	9-Aug-2022	9-Aug-2023
RF CABLE NM TO NM, 0.01-	90-088-079	TELEDYNE STORM MICROWAVE	20134	16-Mar-2022	16-Mar-2023
RF CABLE RIGHT ANGLE NM	90-076-020	TELEDYNE STORM MICROWAVE	20133	16-Mar-2022	16-Mar-2023
RF CABLE	CBL-25FT-NMNM	MINI-CIRCUITS	B094941	25-Aug-2022	25-Aug-2023
SIGNAL GENERATOR (TS8997)	SMB 100A	ROHDE & SCHWARZ	B094876	30-Nov-2020	30-Nov-2023
POWER AMPLIFIER 0.8-2.7GHZ	AS0827-55	MILMEGA	B079820	1-Jul-2011	CNR
SAR DOSIMETRIC E-FIELD	ES3DV3	SPEAG	B079815	1-Mar-2022	1-Mar-2023
TEMPERATURE AND HUMIDITY	ITHX-SD	OMEGA	B079586	14-May-2022	14-May-2023
DIGITAL THERMOMETER	DTM3000SPEZIAL	LKM ELECTRONIC	B079798	7-Dec-2021	7-Dec-2022
DIELECTRIC PROBE KIT	DAK-3.5	SPEAG	B079797	28-Feb-2022	28-Feb-2023
SAR DIPOLE	D1750V2	SPEAG	B079806	25-Jan-2022	25-Jan-2023
SAR DIPOLE	D2450V2	SPEAG	B079805	18-Jan-2022	18-Jan-2023
SAR DIPOLE	D835V2	SPEAG	B079808	18-Jan-2022	18-Jan-2023
SAR DIPOLE	D1900V2	SPEAG	B079809	18-Jan-2022	18-Jan-2023
SAR DIPOLE	D750V3	SPEAG	B085750	18-Jan-2022	18-Jan-2023
85MHZ-14GHZ VECTOR	R140	COPPER MOUNTAIN	20149	16-Mar-2022	16-Mar-2023
POWER AMPLIFIER 0.8-2.7GHZ	AS0827-55	MILMEGA	B079820	1-Jul-2011	CNR

3.2 MEASUREMENT SYSTEM BLOCK DIAGRAM



The Dasy52 SAR test system version 52.10 (4) consists of:

- 1 TX60L Stäubli Robot and system controller cabinet
- 1 Electro Optical Converter mounted on robot's arm
- Robot stand
- Robot remote controller
- Light beam for E-field probe alignment
- DASY5 measurement server
- SAM Twin Phantom or Oval
- Hand-Held/ Laptop device holder
- PC with DASY5 software
- Data Acquisition Electronics (DAE)
- System validation dipole kit
- HBBL600-10000V6 Head Simulating Liquid
- E-field probe
- Warning lamps

3.3 MEASUREMENT SYSTEM PHANTOM DESCRIPTIONS

Type	Dimensions	Frequency Range	Dielectric (ϵ_r)	Loss Tangent	Material Thickness
Oval ELI5	600x400x190	300MHz - 6GHz	4 ± 1	<0.05	2mm $\pm$ 0.2mm
SAM	Human Shaped		< 5		

3.4 MEASUREMENT SYSTEM TISSUE DESCRIPTION

Broadband tissue simulation liquid HBBL600-10000V6 was used for SAR testing. Manufactured by Speag and main ingredients are water and oil.

Dielectric Assessment Kit (DAK) was used to measure tissue parameters daily.

4 SYSTEM VALIDATIONS AND VERIFICATIONS

4.1 SYSTEM VALIDATIONS

System validations were completed following KDB 856664 and are summarized in table below.

Dates	Probe Calibration Point		Probe SN	Measured Tissue Parameters		Validation		
				σ	ε _r	Sensitivity	Linearity	Isotropy
CW								
3/8/2022	Head	750	3272	0.923047	39.4451	Pass	Pass	Pass
3/9/2022	Head	900	3272	0.97708	38.6292	Pass	Pass	Pass
3/9/2022	Head	1750	3272	1.34674	36.8909	Pass	Pass	Pass
3/9/2022	Head	1900	3272	1.42739	36.6829	Pass	Pass	Pass
LTE								
3/10/2022	Head	750	3272	0.875522	38.4611	Pass	Pass	Pass
3/10/2022	Head	900	3272	0.925784	38.003	Pass	Pass	Pass
3/10/2022	Head	1750	3272	1.30322	36.3868	Pass	Pass	Pass
3/10/2022	Head	1900	3272	1.38611	36.1598	Pass	Pass	Pass
802.11								
5/4/2022	Head	2450	3272	1.81295	39.0094	Pass	Pass	Pass

4.2 SYSTEM VERIFICATIONS

System verification is required for the probe calibration points used to measure SAR. The measured results are normalized to 1W and compared to the results from applicable dipole calibration certificates. Results must be within $\pm 10\%$ of target values.

System verifications were completed within 24 hours of SAR testing and results are summarized in table below.

Date	Dipole	Zoom SAR (1g)	Zoom SAR Normalized (1W)	1W Dipole Target SAR (1g)	% Error from Validation Target
10/14/2022	D1900V2	1.94	38.80	39.60	-2.02%
10/17/2022	D1750V2	1.79	35.80	36.30	-1.38%
10/17/2022	D835V2	0.49	9.84	9.80	0.41%
10/18/2022	D750V3	0.42	8.32	8.50	-2.12%
10/20/2022	D2450V2	2.78	55.60	52.30	6.31%

4.3 TISSUE MEASUREMENT RESULTS

The tissue dielectric parameters were measured at the beginning of the test or within 24 hours of the first SAR test. All measured dielectric parameters are within $\pm 10\%$ tolerance values shown in Table 1. The $\pm 10\%$ tolerance is permitted when using SAR correction formula for deviation from target dielectric values.

Date	Frequency MHz	Measured		Target		Deviation	
		Permittivity ϵ_r	Conductivity σ	Permittivity ϵ_r	Conductivity σ	Permittivity ϵ_r	Conductivity σ
10/14/2022	1880	36.27	1.40	40.00	1.40	-3.73	0.00
	1900	36.24	1.41	40.00	1.40	-3.76	0.01
	1909.3	36.22	1.41	40.00	1.40	-3.78	0.01
	1850.7	36.31	1.38	40.00	1.40	-3.69	-0.02
10/17/2022	835	38.23	0.90	41.55	0.91	-3.32	-0.01
	836.5	38.23	0.90	41.55	0.91	-3.32	-0.01
	848.3	38.19	0.90	41.51	0.92	-3.31	-0.01
	1750	36.37	1.31	40.08	1.37	-3.71	-0.06
	1754.3	36.36	1.31	40.07	1.37	-3.71	-0.06
10/18/2022	750	39.23	0.89	41.94	0.89	-2.71	0.00
	699.7	39.46	0.88	42.20	0.89	-2.75	-0.01
	715.3	39.39	0.88	42.12	0.89	-2.73	-0.01
10/20/2022	2450	35.95	1.74	39.20	1.80	-3.25	-0.06
	2412	36.00	1.72	39.27	1.77	-3.27	-0.05
	2480	35.90	1.76	39.16	1.83	-3.26	-0.07

5 ENVIRONMENTAL CONDITIONS

The SAR Laboratory is controlled environment. The ambient temperature is maintained between 18 – 25°C and tissue temperatures are monitored to ensure $\pm 2^\circ\text{C}$ is maintained otherwise tissue parameters are remeasured. The tissue level is confirmed to be $\geq 15\text{cm}$.

Date	Tissue Type	Tissue Temp. Range C°	Lab Temp. Range C°
10/14/2022	Head	21.58 – 22.08	23.1 – 23.9
10/17/2022	Head	21.39 – 21.78	22.9 – 23.5
10/18/2022	Head	20.77 – 22.39	22.5-22.8
10/20/2022	Head	20.87 – 21.52	23.1 – 23.8

RF ambient noise is monitored by conducting a noise cube scan during system verification. A spectrum analyzer is used to monitor unwanted signals that might influence measurements.

The tissue depth was verified to be $\geq 15\text{cm}$.

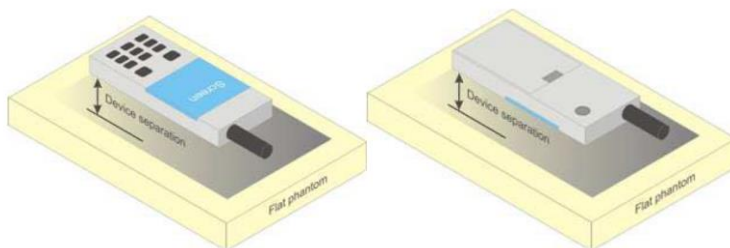
6 MEASUREMENT PROCEDURES

6.1 HEAD CONFIGURATION

NA

6.2 BODY-WORN CONFIGURATION

A body-worn device is a battery-operated wireless device with the ability to transmit while mounted on the body using a strap approved by the device manufacturer. Photos of EUT are included in Part 2 of this report.



6.3 LIMB-WORN CONFIGURATION

NA

6.4 SAR PROCEDURES SETUP

- Area Scan is used for a fast scan in two dimensions to find the area of high field values before any finer measurement around the hotspot. The routines implemented in the DASY5 software can find the maximum locations.
- Zoom Scan is used to assess the peak spatial values within a cubic averaging volume containing 1g and 10g of simulated tissue. The scan measures points within the cube. Once measurement is done the values are displayed within the job's label.
- Power Drift will measure the field at the same location as the most recent power reference measurement within the same procedure and settings. The Power Drift Measurement gives the field difference in dB.
- Z- Scan measure points along a straight vertical line. The lines run along the z-axis of a one-dimension grid.

The area and zoom scan resolutions specified in KDB 865664 are in table below.

Description		≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5 mm ± 1 mm	$\frac{1}{2} \delta \cdot \ln(2)$ mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location		30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}		≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
		When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom} , Δy_{Zoom}		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details. * When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.			

7 LTE OUTPUT POWER MEASUREMENTS

The following tables include LTE power measurement configurations as defined in KBD 941225 D05.

7.1 LTE BAND 2 (1850-1910 MHz)

Test Band: 2 _ 20MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	19.36	20.01	19.35
		50	18.69	19.7	18.96
		99	19.31	19.01	19.54
	50	0	18.53	19.93	18.65
		25	18.44	19.67	18.69
		50	18.86	19.17	18.91
	100	0	18.73	19.55	18.89
	19.53		19.74	19.26	
	16QAM	1	50	18.86	19.56
99			19.49	18.76	19.16
0			18.38	19.37	18.47
50		25	18.23	19.01	18.27
		50	18.34	18.67	18.53
		100	0	18.49	18.9

Test Band: 2 _ 15MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
Size	Offset	LCH	MCH	HCH	
QPSK	1	0	19.29	20.31	19.02
38	18.61	20.06	19.29		
74	19.14	19.33	19.67		
36	0	18.66	20	18.88	
18	18.39	19.73	18.95		
39	18.63	19.47	19.07		
75	0	18.59	19.73	18.95	
19.51	20.09	19.37			
16QAM	1	38	18.67	19.82	19.21
74	19.02	19.38	19.59		
0	18.45	19.43	18.63		
36	18	18.15	19.2	18.5	
39	18.29	18.9	18.73		
75	0	18.36	19.22	18.5	
Test Band: 2 _ 10MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
Size	Offset	LCH	MCH	HCH	
QPSK	1	0	18.39	20.81	19.49
25	19.14	20.59	19.86		
49	19.04	19.9	19.83		
25	0	19.13	20.26	19.2	
13	18.73	20.11	19.3		
25	18.69	20.04	19.6		
50	0	18.87	20.13	19.23	
18.48	19.55	18.65			
16QAM	1	25	18.15	19.29	19.07
49	18.02	18.89	19.03		
0	18.02	19.24	18.31		
25	13	17.47	19	18.42	
25	17.41	18.65	18.63		
50	0	17.51	19	18.44	
Test Band: 2 _ 5MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
Size	Offset	LCH	MCH	HCH	
QPSK	1	0	19.02	20.31	19.58
13	18.47	20.03	19.67		
24	18.42	19.7	19.35		
12	0	18.43	19.93	19.2	
6	18.27	19.7	19.27		
13	18.06	19.51	19.15		
25	0	18.19	19.58	19.24	
18.85	19.83	18.81			
16QAM	1	13	18.5	19.67	18.99
24	18.2	19.37	18.69		
0	18.28	19.16	18.76		
12	6	18.17	19.11	18.86	
13	18.04	19.05	18.79		
25	0	18.16	19.08	18.85	
Test Band: 2 _ 3MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
Size	Offset	LCH	MCH	HCH	
QPSK	1	0	19.19	20.45	19.9
7	18.93	20.35	19.72		
14	18.7	20.1	19.52		
8	0	18.69	19.99	19.55	
4	18.64	19.94	19.39		
7	18.55	19.96	19.32		
15	0	18.64	19.99	19.46	
19	20.06	19.84			
16QAM	1	7	18.76	19.89	19.73
14	18.48	19.78	19.52		
0	18.45	19.09	19.08		
8	4	18.42	19.08	18.93	
7	18.37	19	18.96		
15	0	18.34	19.06	18.8	
Test Band: 2 _ 1.4MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
Size	Offset	LCH	MCH	HCH	
QPSK	1	0	19.27	20.51	19.71
2	19.2	20.46	19.67		
5	19.08	20.42	19.58		
3	0	19.19	20.44	19.83	
2	19.12	20.41	19.76		
3	19.11	20.44	19.69		
6	0	18.87	19.94	19.43	
18.99	19.94	19.56			
16QAM	1	2	18.98	19.85	19.46
5	18.88	19.86	19.42		
0	19.03	20.05	19.37		
3	2	19	19.92	19.35	
3	18.96	19.9	19.36		
6	0	18.5	19.02	19.01	

7.2 LTE BAND 4 (1710-1755 MHz)

Test Band: 4 _ 20MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	20.91	20.86	21.06
		50	20.56	20.36	20.37
		99	20.39	20.4	20.73
	50	0	20.38	20.31	20.41
		25	20.06	20.02	20.04
		50	19.98	20.06	20.13
	100	0	20.2	20.18	20.17
			20.97	20.75	20.85
16QAM	1	50	20.38	20.13	20.17
		99	20.43	20.33	20.36
		0	19.36	19.59	19.66
	50	25	18.98	19.23	19.26
		50	19.14	19.36	19.36
		100	0	19.18	19.48

Test Band: 4 _ 15MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	21.09	21.08	21.13
		38	20.75	20.39	20.72
		74	20.68	20.7	20.9
	36	0	20.25	20.35	20.51
		18	20	20.24	20.17
		39	20.05	20.17	20.34
	75	0	20.11	20.26	20.24
			20.87	20.83	21.16
16QAM	1	38	20.3	20.28	20.61
		74	20.4	20.49	20.89
		0	19.35	19.59	19.62
	36	18	19.07	19.35	19.34
		39	19.11	19.4	19.43
		75	0	19.21	19.46

Test Band: 4 _ 10MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	21.15	21.06	21.15
		25	21.08	20.74	21.02
		49	21.15	20.82	21.15
	25	0	20.2	20.35	20.39
		13	20.04	20.23	20.29
		25	20.02	20.24	20.3
	50	0	20.1	20.3	20.4
			20.46	20.74	21.06
16QAM	1	25	20.18	20.41	20.79
		49	20.18	20.51	20.84
		0	19.3	19.44	19.48
	25	13	19.15	19.33	19.36
		25	19.12	19.33	19.4
		50	0	19.2	19.38

Test Band: 4 _ 5MHz Bandwidth						
Modulation	RB Allocation		Conducted Power (dBm)			
	Size	Offset	LCH	MCH	HCH	
QPSK	1	0	21.15	21.02	21.17	
		13	21.08	20.99	21.27	
		24	21.02	20.93	21.25	
	12	0	20.08	20.31	20.43	
		6	20	20.24	20.34	
		13	20.03	20.23	20.37	
	25	0	20.07	20.26	20.38	
			20.19	20.43	20.17	
	16QAM	1	13	20.17	20.37	20.11
24			20.09	20.35	20.1	
0			19.06	19.43	19.45	
12		6	19.04	19.4	19.41	
		13	19.08	19.41	19.47	
		25	0	19.09	19.34	19.41
Test Band: 4 _ 3MHz Bandwidth						
Modulation		RB Allocation		Conducted Power (dBm)		
		Size	Offset	LCH	MCH	HCH
QPSK	1	0	20.94	20.87	21.26	
		7	21.09	20.91	21.43	
		14	21.07	20.9	21.35	
	8	0	20.01	20.22	20.38	
		4	19.95	20.23	20.35	
		7	19.98	20.22	20.34	
	15	0	19.95	20.26	20.31	
	20.14		20.46	20.82		
	16QAM	1	7	20.09	20.31	20.82
14			20.1	20.39	20.68	
0			19.14	19.34	19.61	
8		4	19.13	19.32	19.57	
		7	19.12	19.3	19.57	
		15	0	19.07	19.32	19.43
Test Band: 4 _ 1.4MHz Bandwidth						
Modulation	RB Allocation		Conducted Power (dBm)			
	Size	Offset	LCH	MCH	HCH	
QPSK	1	0	21.08	20.96	21.26	
		2	21.11	20.94	21.32	
		5	21.05	20.89	21.35	
	3	0	21.07	20.99	21.37	
		2	21.07	21.01	21.37	
		3	21.02	20.93	21.35	
	6	0	19.93	20.23	20.32	
	20.21		20.47	20.48		
	16QAM	1	2	20.15	20.4	20.38
5			20.18	20.41	20.41	
0			20.08	20.27	20.48	
3		2	20.03	20.25	20.52	
		3	20.02	20.25	20.48	
		6	0	19.01	19.27	19.45

7.3 LTE BAND 5 (824-849 MHz)

Test Band: 5 _ 10MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	21.32	21.64	21.12
		25	21.6	20.97	21.21
		49	21.38	20.91	21.37
	25	0	20.57	20.53	20.59
		13	20.5	20.38	20.55
		25	20.44	20.47	20.49
	50	0	20.47	20.43	20.55
16QAM	1	0	20.72	20.89	21.06
		25	20.65	20.61	20.99
		49	20.57	20.7	20.87
	25	0	19.76	19.61	19.74
		13	19.64	19.5	19.67
		25	19.58	19.58	19.68
	50	0	19.62	19.48	19.66
Test Band: 5 _ 5MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	21.5	21.58	21.43
		13	21.67	21.33	21.64
		24	21.5	21.02	21.58
	12	0	20.58	20.46	20.55
		6	20.51	20.38	20.52
		13	20.6	20.45	20.55
	25	0	20.5	20.36	20.56
16QAM	1	0	20.68	20.55	20.41
		13	20.66	20.51	20.38
		24	20.6	20.56	20.44
	12	0	19.63	19.73	19.64
		6	19.67	19.69	19.63
		13	19.76	19.73	19.68
	25	0	19.63	19.56	19.61

Test Band: 5 _ 3MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	21.41	21.53	21.5
		7	21.54	21.44	21.52
		14	21.6	21.31	21.47
	8	0	20.6	20.51	20.58
		4	20.55	20.38	20.56
		7	20.59	20.41	20.57
	15	0	20.63	20.39	20.55
16QAM	1	0	20.99	20.92	20.65
		7	20.78	20.9	20.66
		14	20.97	20.78	20.63
	8	0	19.73	19.69	19.71
		4	19.7	19.7	19.66
		7	19.69	19.67	19.7
	15	0	19.65	19.56	19.62
Test Band: 5 _ 1.4MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	21.44	21.58	21.58
		2	21.44	21.52	21.6
		5	21.62	21.56	21.61
	3	0	21.51	21.57	21.52
		2	21.51	21.54	21.52
		3	21.59	21.56	21.42
	6	0	20.57	20.51	20.62
16QAM	1	0	20.71	20.69	20.72
		2	20.69	20.66	20.69
		5	20.77	20.65	20.85
	3	0	20.61	20.43	20.6
		2	20.6	20.45	20.61
		3	20.58	20.43	20.57
	6	0	19.65	19.5	19.53

7.4 LTE BAND 12 (699-716 MHz)

Test Band: 12 _ 10MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	21.15	21.39	21.53
		25	21.55	21.54	20.99
		49	21.37	20.99	21.38
	25	0	20.48	20.57	20.64
		13	20.41	20.47	20.52
		25	20.43	20.53	20.51
	50	0	20.48	20.48	20.47
	16QAM	1	20.53	20.97	20.99
			25	20.86	20.85
			49	20.42	20.92
		25	0	19.65	19.73
			13	19.56	19.5
			25	19.65	19.61
	50	0	19.49	19.63	19.65
Test Band: 12 _ 5MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	21.09	21.64	21.13
		13	21.36	21.58	21.15
		24	21.46	21.33	21.58
	12	0	20.45	20.46	20.59
		6	20.43	20.42	20.56
		13	20.43	20.41	20.52
	25	0	20.44	20.38	20.56
	16QAM	1	20.53	20.34	20.7
			13	20.58	20.22
			24	20.46	20.24
		12	0	19.58	19.55
			6	19.57	19.57
			13	19.57	19.59
	25	0	19.56	19.56	19.74

Test Band: 12 _ 3MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	21.35	21.58	21.31
		7	21.45	21.62	21.41
		14	21.41	21.54	21.59
	8	0	20.39	20.52	20.53
		4	20.46	20.47	20.46
		7	20.47	20.49	20.49
	15	0	20.51	20.44	20.55
	16QAM	1	20.45	20.96	20.57
			7	20.62	20.89
			14	20.75	20.85
		8	0	19.56	19.72
			4	19.56	19.66
			7	19.56	19.7
	15	0	19.57	19.62	19.61
Test Band: 12 _ 1.4MHz Bandwidth					
Modulation	RB Allocation		Conducted Power (dBm)		
	Size	Offset	LCH	MCH	HCH
QPSK	1	0	21.27	21.38	21.43
		2	21.25	21.47	21.54
		5	21.34	21.53	21.7
	3	0	21.21	21.47	21.48
		2	21.22	21.48	21.64
		3	21.24	21.45	21.54
	6	0	20.41	20.48	20.51
	16QAM	1	20.48	20.73	20.7
			2	20.51	20.7
			5	20.61	20.66
		3	0	20.46	20.54
			2	20.43	20.56
			3	20.39	20.55
	6	0	19.44	19.49	19.64

8 WLAN OUTPUT POWER MEASUREMENTS

Test Mode	Frequency (MHz)	Measured Peak Output Power (dBm)
802.11b	2412	16.41
	2437	16.19
	2462	16.20
802.11g	2412	21.75
	2437	21.46
	2462	22.09
802.11n(HT20)	2412	21.59
	2437	21.70
	2462	21.81

Note:

802.11B attenuation set to 24. 802.11g and 802.11n(HT20) attenuation set to 10.

9 BT OUTPUT POWER MEASUREMENTS

Test Mode	Frequency (MHz)	Measured Peak Output Power (dBm)
GFSK	2402	7.94
	2441	8.04
	2480	8.62
8DPSK	2402	10.53
	2441	10.85
	2480	11.35

Note:

Power set to 5.

10 BLE OUTPUT POWER MEASUREMENTS

Test Mode	Frequency (MHz)	Measured Peak Output Power (dBm)
1M	2402	8.04
	2440	8.48
	2480	8.5

Note:

Power set to 5.

Bluetooth LE was not tested for SAR due to the higher power with Bluetooth Classic.

11 SAR RESULTS

Scaled SAR results include scaling up to maximum tune-up tolerance and negative drift.

LTE SAR Test Reduction Procedure:

KDB 941225 D05 SAR for LTE Devices:

Section 4.1 note 3 - For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing; therefore, the requirement for H, M, and L channels may not fully apply.

Section 5.2.1 - Start with the largest channel bandwidth then measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle, and lower edge of each required test channel. When the reported SAR is $\leq 50\%$ of applied limit, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is $> 90\%$ of applied limit, SAR is required for all three RB offset configurations for that required test channel.

Section 5.2.2 - The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.

Section 5.2.3 - For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations, and the highest reported SAR for 1 RB and 50% RB allocation in 5.2.1 and 5.2.2 are $\leq 50\%$ of limit. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is $> 90\%$ of limit, the remaining required test channels must also be tested.

Section 5.2.4 - For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in 5.2.1, 5.2.2, and 5.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is $> \frac{1}{2}$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is $> 90\%$ of limit.

Section 5.3 - For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in 5.2 to determine the channels and RB configurations that need SAR testing, then only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is $> \frac{1}{2}$ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration, or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg. The equivalent channel configuration for the RB allocation, RB offset and modulation, etc., is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5 MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing.

11.1 LTE BAND 2 (1850-1910 MHz)

Test Position	Test Mode	Channel	Frequency	Top (mm)	Middle (mm)	Bottom (mm)	Max Power (dBm)	Meas. Power (dBm)	Power Scaling factor	Drift (dB)	Drift Scaling factor	Mes. SAR 1g	Mes. SAR 10g	Scaled SAR 1g	Scaled SAR 10g	Plot No.
Back	20MHz BW 1 RB Low Offset	18900	1880	13	0	11	21.86	20.01	1.53	-0.39	1.09	0.716	0.749	1.20	1.25	1
Back	20MHz BW 1 RB Low Offset	18607	1850.7	13	0	11	21.86	19.36	1.78	-0.11	1.03	0.332	0.202	0.61	0.37	
Back	20MHz BW 1 RB Low Offset	19193	1909.3	13	0	11	21.86	19.54	1.71	0	1.00	0.573	0.347	0.98	0.59	
Back	20MHz BW 50 RB Low Offset	18900	1880	13	0	11	21.86	19.93	1.56	-0.25	1.06	0.45	0.273	0.74	0.45	
Back	20MHz BW 100 RB Low Offset	18900	1880	13	0	11	21.86	19.55	1.70	-0.3	1.07	0.517	0.31	0.94	0.57	

Additional testing not required per LTE SAR Test Reduction Procedure.

11.2 LTE BAND 4 (1710-1755 MHz)

Test Position	Test Mode	Channel	Frequency	Top (mm)	Middle (mm)	Bottom (mm)	Max Power (dBm)	Meas. Power (dBm)	Power Scaling factor	Drift (dB)	Drift Scaling factor	Mes. SAR 1g	Mes. SAR 10g	Scaled SAR 1g	Scaled SAR 10g	Plot No.
Back	20MHz BW 1 RB Low Offset	20393	1754.3	13	0	11	22.24	21.06	1.31	-0.25	1.06	0.546	0.348	0.76	0.48	2
Back	20MHz BW 50 RB Low Offset	20393	1754.3	13	0	11	22.24	20.41	1.52	-0.07	1.02	0.364	0.23	0.56	0.36	

Additional testing not required per LTE SAR Test Reduction Procedure.

11.3 LTE BAND 5 (824-849 MHz)

Test Position	Test Mode	Channel	Frequency	Top (mm)	Middle (mm)	Bottom (mm)	Max Power (dBm)	Meas. Power (dBm)	Power Scaling factor	Drift (dB)	Drift Scaling factor	Mes. SAR 1g	Mes. SAR 10g	Scaled SAR 1g	Scaled SAR 10g	Plot No.
Back	10MHz BW 1 RB Low Offset	20525	836.5	13	0	11	23.21	21.64	1.44	-0.02	1.00	0.325	0.235	0.47	0.34	
Back	10MHz BW 25 RB Low Offset	20643	848.3	13	0	11	23.21	20.59	1.83	-0.04	1.01	0.31	0.223	0.57	0.41	3

Additional testing not required per LTE SAR Test Reduction Procedure.

11.4 LTE BAND 12 (699-716 MHz)

Test Position	Test Mode	Channel	Frequency	Top (mm)	Middle (mm)	Bottom (mm)	Max Power (dBm)	Meas. Power (dBm)	Power Scaling factor	Drift (dB)	Drift Scaling factor	Mes. SAR 1g	Mes. SAR 10g	Scaled SAR 1g	Scaled SAR 10g	Plot No.
Back	10MHz BW 1 RB Mid Offset	23017	699.7	13	0	11	22	21.55	1.11	-0.24	1.06	0.397	0.289	0.47	0.34	
Back	10MHz BW 25 RB Low Offset	23173	715.3	13	0	11	22	20.64	1.37	0	1.00	0.371	0.27	0.51	0.37	4

Additional testing not required per LTE SAR Test Reduction Procedure.

11.5 WLAN 2.4GHz

Test Position	Test Mode	Channel	Frequency	Top (mm)	Middle (mm)	Bottom (mm)	Max Power (dBm)	Meas. Power (dBm)	Power Scaling factor	Drift (dB)	Drift Scaling factor	Mes. SAR 1g	Mes. SAR 10g	Scaled SAR 1g	Scaled SAR 10g	Plot No.
Back	802.11b 1Mbps	1	2412	13	0	11	16.41	16.41	1.00	-0.89	1.23	0.00246	0.000962	0.00	0.00	5

SAR not required for OFDM: 802.11b adjusted SAR $\leq 1.2\text{W/kg}$

11.6 BLUETOOTH CLASSIC

Test Position	Test Mode	Channel	Frequency	Top (mm)	Middle (mm)	Bottom (mm)	Max Power (dBm)	Meas. Power (dBm)	Power Scaling factor	Drift (dB)	Drift Scaling factor	Mes. SAR 1g	Mes. SAR 10g	Scaled SAR 1g	Scaled SAR 10g	Plot No.
Back	8DPSK 3Mbps DH5	78	2480	13	0	11	11.35	11.35	1.00	-5.04	3.19	7.96E-05	9.15E-06	0.00	0.00	6

12 VARIABILITY ASSESSMENT

Per the guidelines in KDB 865664 SAR variability assessment is not required because SAR results are below 50% threshold of applicable limit.

13 SIMULTANEOUS TRANSMISSION

This device does support simultaneous transmissions.

		Freq (MHz)	CH	Modulation	SAR
Body	WWAN	1880	18900	QPSK	1.20
	WLAN	2412	1	DSSS	0.00
Total Simultaneous SAR					1.20

14 SYSTEM UNCERTAINTY

A System uncertainty analysis per KDB 865664 is not required since reported SAR is < 93.75% of applicable limit.

Per guidelines of ISO 17025 and RSS - 102 reported system uncertainty is required and therefore included in Part 3.

15 REVISION HISTORY

Revision Level	Description of changes	Revision Date
0	Initial release	15 November 2022
1	Cover Page - Module FCC/IC IDs were added. Section 2.3 – Bluetooth/WLAN antenna gain was added. Section 2.7 – KDB 996369 D01 v02 was added.	26 January 2023