SRTC
The State Radio_monitoring_center Testing Center
国家无线电监测中心检测中心

Certificate Number: 5055.02

TEST REPORT FOR SAR TESTING

Report No：SRTC2021-9004(F)-21102101(H)

Product Name: Fi Smart Dog Collar 2

Applicant: Barking Labs Corp.

Manufacturer: Barking Labs Corp.

Specification: Part 2.1093

IEEE Std 1528

KDB Procedures

FCC ID: 2ARXN-FC2B

The State Radio_monitoring_center Testing Center (SRTC)

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1. GENERAL INFORMATION

1.1 Notes of the test report

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The test results relate only to individual items of the samples which have been tested.

The certification and accreditation identifiers used in this report shall not be applicable to the tested or calibrated samples thereof. The manufacturer shall not mark the tested samples or items (or a separate part of the item) with the identifiers of certification and accreditation to mislead relevant parties about the tested samples or items.

1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
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1.3 Applicant's details

Company:	Barking Labs Corp.
Address:	419 Lafayette St., Fl. 2

1.4 Manufacturer's details

Company:	Barking Labs Corp.
Address:	419 Lafayette St., Fl. 2

1.5 Test Environment

Date of Receipt of test sample at SRTC:	2021.10.25
Testing Start Date:	2021.10.26
Testing End Date:	2021.11.09

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	25	35

Normal Supply Voltage (Vdc.):	3.85

2. DESCRIPTION OF THE DEVICE UNDER TEST

2.1 Final Equipent Build Status

Wireless Technology and Frequency Bands	☐GSM Band: GSM850/1900 ☐WCDMA Band: FDD II/IV/V ☒LTE CAT-M: 2/4/12 ☒Wi-Fi Band: 2.4GHz ☒BT/BLE
Mode	GSM ☐Voice (GMSK) ☐GPRS (GMSK) ☐EGPRS (GMSK/8PSK) WCDMA ☐UMTS Rel. 99 ☐HSDPA (Rel. 5) ☐HSUPA (Rel. 6) ☐HSPA+ (Rel. 7) ☐DC-HSDPA (Rel. 8) LTE CAT-M1 ☒QPSK ☒16QAM ☐64QAM Wi-Fi2.4GHz (802.11b/g/n/ax) ☒802.11b ☒802.11g ☒802.11n (20MHz) ☐802.11ax (20MHz) Wi-Fi5GHz ☐802.11a ☐802.11n (20MHz/40MHz) ☐802.11ac (20MHz/40MHz/80MHz) ☐802.11ax (20MHz/40MHz/80MHz) Bluetooth ☐BR(GFSK) ☐EDR(π/4 DQPSK , 8-DPSK) ☒BLE(GFSK) NFC Phones with built-in NFC functions do not require separate SAR testing and can generally be tested according to the SAR measurement procedures normally required for the phone. Influences of the hardware introduced by the built-in NFC functions are inherently considered through testing of the other transmitters that require SAR evaluation.
Duty Cycle*	LTE(FDD): 100% LTE(TDD): 63.3% maximum Bluetooth: 76.2% (GFSK (LE 1Mbps)), 71.1% (GFSK (LE 2Mbps)) WIFI 2.4GHz: 11b 99.26% 11g 94.76% 11n20 94.95%
Note	For licensed cellular network duty cycle is inherent. For unlicensed network WLAN Duty cycle is depends on the data traffic, and the traffic allocation

	in operating mode could be the most conservative condition which with 100% duty cycle. SAR measurement also use non signalling mode, so the duty factor shall be taken into consideration.
IMEI	1# 2#
HW Version	Rev.C
SW Version	1.0

2.2 Support Equipment

Equipment	Battery
Type	Li-Lon
Manufacturer	Jiade Energy Technology(Zhuhai)Co.,Ltd.
Model Number	JKIT
Capacity	520mAh
Nominal Voltage	3.85

Equipment	Charger			
Manufacturer	JIANGSU CHENYANG ELECTRON CO., LTD.			
Model Number	CA05-050100U			
Power Rating	I/P Vac	100-240	mA	150
	O/P Vdc	5	mA	1000

3. REFERENCE SPECIFICATION

Specification	Version	Title
Part 2.1093	2020	Radio frequency radiation exposure evaluation: portable devices.
IEEE Std 1528	2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB 447498 D01	v06	General RF Exposure Guidance
KDB 447498 D02	v02r01	SAR MEASUREMENT PROCEDURES FOR USB DONGLE TRANSMITTERS
KDB 648474 D04	v01r03	Handset SAR
KDB 941225 D01	v03r01	3G SAR Procedures
KDB 248227 D01	v02r02	SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS
KDB 865664 D01	v01r04	SAR Measurement from 100 MHz to 6 GHz
KDB 865664 D02	v01r02	RF Exposure Reporting
KDB 941225 D05	v02r05	SAR for LTE Devices

4. TEST CONDITIONS

4.1 Picture to demonstrate the required liquid depth

The liquid depth is large than 15cm in the used SAM phantoms in flat section, and the depth of the tissue simulant was 15.0 ± 0.5 cm measured from the ear reference point during system checking and device measurements.

Liquid depth for SAR Measurement

4.2 Test Signal, Frequencies and Output Power

The device was put into operation by using a call tester. Communication between the device and the call tester was established by air link.
The device output power was set to maximum power level for all tests; a fully charged battery was used for every test sequence.
In all operating bands the measurements were performed on middle channel, and few of them were also performed on lowest and highest channels.

4.3 SAR Measurement Set-up

The system is based on a high precision robot (working range greater than 0.9m), which positions the probes with a positional repeatability of better than ± 0.02mm. Special E-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length =300mm) to the data acquisition unit. A cell controller system contains the power

supply, robot controller, teaches pendant (Joystick), and remote control, is used to drive the robot motors.
The PC consists of the Micron Pentium IV computer with Win7 system and SAR Measurement Software DASY5 Professional, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot.
A data acquisition electronic (DAE) circuit performs the signal amplification; signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The DAE consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines.
The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection
The robot uses its own controller with a built in VME-bus computer.

4.4 Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528.
System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.
The SPEAG device holder was used to position the device in all tests whilst a tripod was used to position the validation dipoles against the flat section of phantom.

4.5 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEEE 1528. All tests were carried out using simulants whose dielectric parameters were within
± 10% below 3GHz and ± 5% above 3GHz of the recommended values when use DASY system according to KDB865664D01. All tests were carried out within 24 hours of measuring the dielectric parameters.

Tissue Stimulant Recipes	
Name	Broadband tissue-equivalent liquid
Type	HBBL600-6000V6 Simulating Liquid
Note: The stimulant could be the same for head and body.	

4.6 DESCRIPTION OF THE TEST PROCEDURE

4.6.1 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the Dasy system.

Device holder supplied by SPEAG

4.6.2 Test Exposure Conditions

4.6.2.1 Head Configuration

Measurements were made in “cheek” and “tilt” positions on both the left hand and right-hand sides of the phantom.

The positions used in the measurements were according to IEEE 1528 "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques".

4.6.2.2 Body Worn Configuration

The device was placed in the SPEAG holder below the flat section of the phantom. The distance between the device and the phantom was kept at the separation distance using a separate flat spacer that was removed before the start of the measurements. And the distance is normally determined according to the actual scene which might be the worst use condition for general exposure. The device’s front and rear were oriented facing the phantom since these orientations give higher results for most regular portable devices.

4.6.2.3 Hotspot Configuration

Hotspot mode SAR is measured for all edges and surfaces of the device with a transmitting antenna located within 25 mm from that surface or edge; for the data modes, wireless technologies and frequency bands supporting hotspot mode.

4.6.3 Scan Procedure

First, area scans were used for determination of the field distribution and the approximate location of the local peak SAR values. The SAR distribution is scanned along the inside surface, at least for an area larger than the projection of the handset and antenna. The angle between the probe axis and the surface normal line is recommended but not required to be less than 30°. The SAR distribution is first measured on a 2-D coarse grid. The scan region should cover all areas that are exposed and encompassed by the projection of the handset. There are 15 mm × 15 mm (equal or less than 2GHz), 12 mm × 12 mm (from 2GHz~4GHz) and 10mm x 10mm (from 4GHz~6GHz) measurement grid used when two staggered one-dimensional cubic splines are used to estimate the maximum SAR location.

When the reported 1g-SAR estimated by area scan is less than 1.40 w/kg.

Zoom scan was performed by using the configuration mentioned below or more conservative scan area and step to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.

Below 3GHz：32mmX32mmX30mm scan area with 8 mm X8 mm X5 mm steps
2GHz-3GHz：32mmX32mmX30mm scan area with 8 mm X8 mm X5 mm steps
3GHz-4GHz：28mmX28mmX28mm scan area with 7 mm X7 mm X4 mm steps
4GHz-5GHz：25mmX25mmX24mm scan area with 5 mm X5 mm X3 mm steps

5GHz-6GHz： 25mmX25mmX22mm scan area with 5 mm X5 mm X2 mm steps

4.6.4 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.

The interpolation, extrapolation and maximum search routines within DASY5 are all based on the modified Quadratic Shepard's method (Robert J. Renka, Multivariate Interpolation of Large Sets of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).

The interpolation scheme combines a least-square fitted function method with a weighted average method. A triradiate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighboring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.

In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

5 RESULT SUMMARY

The maximum reported SAR values for all exposure conditions are given as follows. The device conforms to the requirements of the standard(s) when the maximum reported SAR value is less than or equal to the limit.

Standalone Transmission Summary					
Exposure Position	Frequency Band	SAR Result(W/kg)	Highest SAR Result(W/kg)	Limit (W/kg)	Result
Limb(0mm)	LTE CAT-M Band 2	0.39	0.49	4.0	Pass
	LTE CAT-M Band 4	0.49			
	LTE CAT-M Band 12	0.15			
	WLAN 2.4GHz	0.31			

Simultaneous Transmission Summary

Simultaneous Transmission Summary				
Exposure Position	Mode	Highest SAR Result(W/kg)	Limit(W/kg)	Verdict
Limb(0mm)	LTE CAT-M Band 4+WiFi 2.4GHz	0.74	4.0	Pass

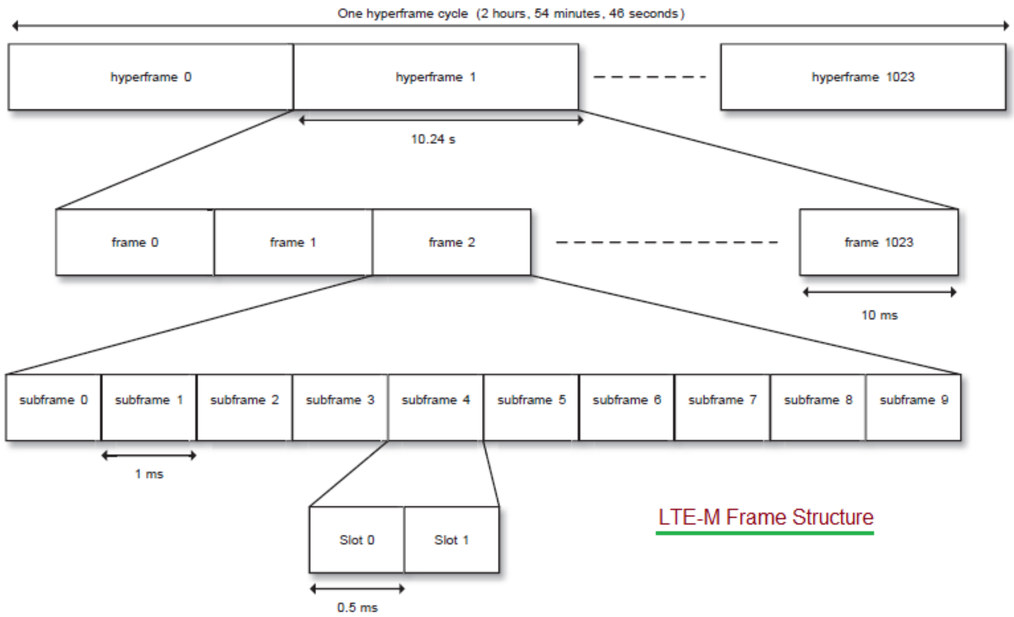
This Test Report Is Approved by: Mr. Peng Zhen 彭振	Review by: Mr. Li Bin 李彬
Tested and issued by: Mr. Du Wei 杜威	Approved date: 20211111

6 TEST RESULT

6.1 Measurement result

UE category M1 and M2 is designed to operate in the E-UTRA operating bands in both half duplex FDD mode and full-duplex FDD mode, as well as TDD mode. LTE-M follows 3GPP specifications similar to LTE technology. LTE-M Cat-0, Cat-M1 and Cat-M2 follow 3GPP TS 36 series of rel.12, rel.13 and rel.14 respectively.

The figure depicts LTE-M frame structure similar to LTE technology. One subframe duration is about 1ms. And the duty cycle is inherent as100%



LTE-M Frame Structure

Cat M

Note: RB allocation mentioned below is for all Bandwidths, and the Frequency Range are divided to 3 ranges (Low, Mid, High)

LTE CAT-M Band 2

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				18607	18900	19193	Tune-up Tolerance
				1850.7	1880	1909.3	
1.4	QPSK	1	0	22.65	22.44	22.92	23.0
		3	0	21.75	21.70	22.10	22.5
		6	0	20.79	20.71	21.16	21.5
	16QAM	1	0	21.41	21.74	22.23	22.5
		3	0	20.71	20.53	21.05	21.5
		6	0	20.80	20.72	21.20	21.5

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				18615	18900	19185	Tune-up Tolerance
				1851.5	1880	1908.5	
3	QPSK	1	0	22.77	22.36	22.92	23.0
		8	0	21.85	21.72	22.11	22.5
		15	0	20.91	20.72	21.17	21.5
	16QAM	1	0	21.96	21.76	22.25	22.5
		8	0	20.74	20.54	20.97	21.0
		15	0	20.92	20.64	21.21	21.5

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				18625	18900	19175	Tune-up Tolerance
				1852.5	1880	1907.5	
5	QPSK	1	0	22.73	22.43	22.88	23.0
		12	0	21.81	21.63	22.00	22.0
		25	0	21.90	21.67	22.03	22.5
	16QAM	1	0	22.17	21.95	22.30	22.5
		12	0	20.91	20.61	21.08	21.5
		25	0	21.81	21.50	21.97	22.0

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				18650	18900	19150	Tune-up Tolerance
				1855	1880	1905	
10	QPSK	1	0	22.73	22.43	22.88	23.0
		25	0	21.81	21.63	22.00	22.0
		50	0	21.90	21.67	22.03	22.5
	16QAM	1	0	22.17	21.95	22.30	22.5
		25	0	20.91	20.61	21.08	21.5
		50	0	21.81	21.50	21.97	22.0

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				18675	18900	19125	Tune-up Tolerance
				1857.5	1880	1902.5	
15	QPSK	1	0	22.73	22.43	22.88	23.0
		36	0	21.81	21.63	22.00	22.0
		75	0	21.90	21.67	22.03	22.5
	16QAM	1	0	22.17	21.95	22.30	22.5
		36	0	20.91	20.61	21.08	21.5
		75	0	21.81	21.50	21.97	22.0

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				18700	18900	19100	Tune-up Tolerance
				1860	1880	1900	
20	QPSK	1	0	22.62	22.40	22.67	23.0
		50	0	22.72	22.45	22.81	23.0
		100	0	22.76	22.49	22.84	23.0
	16QAM	1	0	22.00	21.84	21.99	22.0
		50	0	21.71	21.57	21.72	22.0
		100	0	22.64	22.49	22.65	23.0

LTE CAT-M Band 4

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				19957	20175	20393	Tune-up Tolerance
				1710.7	1732.5	1754.3	
1.4	QPSK	1	0	22.38	22.25	22.41	22.5
		3	0	21.45	21.45	21.57	22.0
		6	0	20.38	20.28	20.59	21.0
	16QAM	1	0	21.39	21.30	21.45	21.5
		3	0	20.37	20.26	20.38	20.5
		6	0	20.31	20.29	20.54	21.0

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				19965	20175	20385	Tune-up Tolerance
				1711.5	1732.5	1753.5	
3	QPSK	1	0	22.31	22.27	22.35	22.5
		8	0	21.48	21.36	21.58	22.0
		15	0	20.32	20.31	20.47	20.5
	16QAM	1	0	21.40	21.28	21.46	21.5
		8	0	20.38	20.24	20.38	20.5
		15	0	20.43	20.27	20.55	21.0

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				19975	20175	20375	Tune-up Tolerance
				1712.5	1732.5	1752.5	
5	QPSK	1	0	22.25	22.22	22.40	22.5
		12	0	21.35	21.28	21.47	21.5
		25	0	21.38	21.32	21.51	22.0
	16QAM	1	0	21.63	21.51	21.72	22.0
		12	0	20.42	20.42	20.60	21.0
		25	0	21.34	21.34	21.53	22.0

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				20000	20175	20350	Tune-up Tolerance
				1715	1732.5	1750	
10	QPSK	1	0	22.37	22.23	22.35	22.5
		25	0	21.32	21.30	21.43	21.5
		50	0	21.35	21.33	21.46	21.5
	16QAM	1	0	21.66	21.52	21.79	22.0
		25	0	21.47	21.33	21.48	21.5
		50	0	21.51	21.34	21.47	22.0

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				20025	20175	20325	Tune-up Tolerance
				1717.5	1732.5	1747.5	
15	QPSK	1	0	22.39	22.28	22.37	22.5
		36	0	22.33	22.24	22.36	22.5
		75	0	22.38	22.33	22.45	22.5
	16QAM	1	0	21.65	21.55	21.66	22.0
		36	0	21.47	21.37	21.48	21.5
		75	0	22.46	22.35	22.47	22.5

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				20050	20175	20300	Tune-up Tolerance
				1720	1732.5	1745	
20	QPSK	1	0	22.27	22.27	22.32	22.5
		50	0	22.33	22.25	22.32	22.5
		100	0	22.42	22.34	22.41	22.5
	16QAM	1	0	21.65	21.55	21.61	22.0
		50	0	21.47	21.37	21.43	21.5
		100	0	22.46	22.35	22.42	22.5

LTE CAT-M Band 12

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				23017	23095	23173	Tune-up Tolerance
				699.7	707.5	715.3	
1.4	QPSK	1	0	23.09	23.12	22.93	23.5
		3	0	22.10	22.10	22.07	22.5
		6	0	21.07	21.12	21.03	21.5
	16QAM	1	0	21.96	21.95	21.93	22.0
		3	0	20.96	21.03	20.84	21.5
		6	0	21.07	21.13	20.95	21.5

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				23025	23095	23165	Tune-up Tolerance
				700.5	707.5	714.5	
3	QPSK	1	0	23.08	23.03	23.00	23.5
		8	0	22.07	22.11	21.98	22.5
		15	0	21.09	21.14	21.01	21.5
	16QAM	1	0	22.02	22.08	21.96	22.5
		8	0	20.96	20.96	20.87	21.0
		15	0	21.06	21.11	20.98	21.5

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				23035	23095	23155	Tune-up Tolerance
				701.5	707.5	713.5	
5	QPSK	1	0	22.93	22.97	22.90	23.0
		12	0	22.10	22.02	21.95	22.5
		25	0	22.13	22.06	21.98	22.5
	16QAM	1	0	22.91	22.95	22.87	23.0
		12	0	21.10	21.15	21.07	21.5
		25	0	21.99	22.03	21.95	22.5

BW	Modulation	RB Size	RB Offset	Conducted power(dBm)			
				23060	23095	23130	Tune-up Tolerance
				704	707.5	711	
10	QPSK	1	0	23.07	23.01	22.97	23.5
		25	0	21.98	22.04	22.01	22.5
		50	0	22.01	22.07	22.03	22.5
	16QAM	1	0	22.90	23.02	22.86	23.5
		25	0	22.03	22.09	21.99	22.5
		50	0	21.98	22.05	21.91	22.5

Bluetooth

BLE

Modulation type	Conducted Average Power(dBm)			Tune up
	2402MHz	2440MHz	2480MHz	
GFSK (LE 1Mbps)	-6.36	-6.67	-6.79	-6.0
GFSK (LE 2Mbps)	-8.95	-9.20	-9.32	-8.5

WiFi

WIFI 2.4GHz

Mode	Freq(MHz)	Average power output (dBm)	Tune-up Tolerance (dBm)
802.11b	2412MHz	15.26	15.5
	2437MHz	14.82	
	2462MHz	14.52	
802.11g	2412MHz	14.09	14.5
	2437MHz	13.79	
	2462MHz	13.56	
802.11n20M	2412MHz	14.03	14.5
	2437MHz	13.69	
	2462MHz	13.65	

6.2 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Mothod1:

According to the KDB447498 4.3.1 (1)

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f (GHz)] ≤ 3.0 for 1-g SAR, 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

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

This is equivalent to [(max. power of channel, including tune-up tolerance, mW)/(60/√f(GHz) mW)] ·[20 mm/(min.test separation distance, mm)] ≤ 1.0 for 1-g SAR; also see Appendix A for approximate exclusion threshold values at selected frequencies and distances.

Mothod2:
According to the KDB447498 appendix A

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

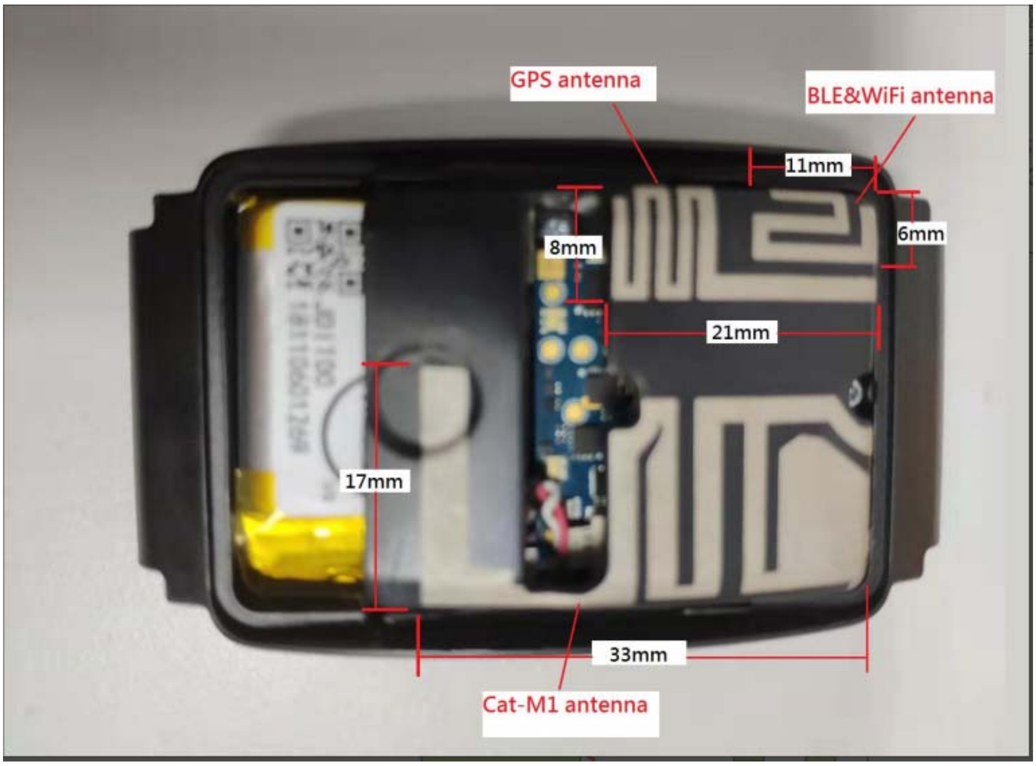
Note: **10-g Extremity SAR Test Exclusion Power Thresholds are 2.5 times higher than the 1-g SAR Test Exclusion Thresholds indicated above.** These thresholds do not apply, by extrapolation or other means, to occupational exposure limits.

Summary of Transmitters

Band/Mode	Max conducted power adjusted for tune-up tolerance(mW)	Exposure condition	SAR test exclusion threshold (mW)	Standalone SAR Required
2.4GHz BT/BLE	0.23	Limbs	25	No
2.4GHz Wi-Fi	33.57	Limbs	25	Yes

6.3 RF exposure conditions

Refer to the follow picture “Antenna information” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.



All of Implementation antenna
Cat-M1 antenna: LTE Cat-M B2/4/12
BLE&WiFi antenna: BLE,WiFi 2.4GHz

6.4 System Checking

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyser. For the measurement of the following parameters the SPEAG DAKS-3.5 dielectric parameter probe is used, representing the open-ended coaxial probe measurement procedure.

Date Tested	Freq.(MHz)	Liquid parameters	Measured	Target	Delta (%)	Tolerance (%)	Verdit
2021.11.05	750	εr	41.222	41.9	-1.62	±10	Pass
		σ[S/m]	0.89	0.89	-0.24	±10	Pass
2021.11.06	1800	εr	39.048	40.0	-2.38	±10	Pass
		σ[S/m]	1.36	1.40	-2.83	±10	Pass
2021.11.03	2450	εr	38.420	39.2	-1.99	±10	Pass
		σ[S/m]	1.72	1.80	-4.34	±10	Pass

Note: For DASY system, the conservative tolerance 5% could expand to 10% when the frequency under 3GHz

A system check measurement was made following once the determination of the dielectric parameters of the simulant, using the dipole validation kit. The system checking results (dielectric parameters and SAR values) are given in the table below.

Date Tested	Freq.(MHz)	SAR measured (normalized to 1W)		Target (Ref. Value)	Delta (%)	Tolerance (%)	Verdit
2021.11.05	750	1g	8.44	8.40	0.48	±10	Pass
2021.11.06	1800	1g	37.44	38.90	-3.75	±10	Pass
2021.11.03	2450	1g	51.52	53.00	-2.79	±10	Pass

6.5 SAR TEST RESULT

In order to determine the largest value of the peak spatial-average SAR of a handset, all device positions, configurations, and operational modes should be tested for each frequency band according to Steps 1 to 3 below.

Step 1: The tests should be performed at the channel that is closest to the center of the transmit frequency band.

a) All device positions (cheek and tilt, for both left and right sides of the SAM phantom),

b) All configurations for each device position in a), e.g., antenna extended and retracted, and

c) All operational modes for each device position in item a) and configuration in item b) in each frequency band, e.g., analog and digital, If more than three frequencies need to be tested (i.e., Nc > 3), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

Step 2: For the condition providing the highest peak spatial-average SAR determined in Step 1 for each frequency, perform all tests at all other test frequency channels, e.g., lowest and highest frequencies. In addition, for all other conditions (device position, configuration, and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies should be tested as well.

Step 3: Examine all data to determine the largest value of the peak.

Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.

Scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.

Duty Factor = 1 / Duty Cycle(%)

For cellular network:

Reported SAR (W/kg) = Measured SAR (W/kg) * Scaling Factor

For WLAN

Reported SAR (W/kg) = Measured SAR (W/kg) * Scaling Factor*Duty factor .

2. The distance between the EUT and the phantom bottom is 0mm.

The measured and reported Head/body SAR values for the test device are tabulated below:

Mode: LTE CAT-M Band 2

fL (MHz)=1860 MHz fM (MHz)=1880MHz fH (MHz)= 1900MHz

Limit of SAR (W/kg) : <4W/kg (10g Average)

Test case				Meas power(dBm)	Tune-up(dBm)	Scaling factor	Meas SAR(w/kg)		Report SAR(w/kg)	
Mode	Exposure condition	Position	Channel				First	Second	First	Second
QPSK 1RB	Limb	Back	L	22.62	23.00	1.09	---	---	---	---
			M	22.40	23.00	1.15	0.12	---	0.14	---
			H	22.67	23.00	1.08	---	---	---	---
		Front	L	22.62	23.00	1.09	---	---	---	---
			M	22.40	23.00	1.15	0.19	---	0.22	---
			H	22.67	23.00	1.08	---	---	---	---
		Top	L	22.62	23.00	1.09	---	---	---	---
			M	22.40	23.00	1.15	0.11	---	0.13	---
			H	22.67	23.00	1.08	---	---	---	---
		Bottom	L	22.62	23.00	1.09	---	---	---	---
			M	22.40	23.00	1.15	0.34	---	0.39	---
			H	22.67	23.00	1.08	---	---	---	---
		Left	L	22.62	23.00	1.09	---	---	---	---
			M	22.40	23.00	1.15	0.02	---	0.02	---
			H	22.67	23.00	1.08	---	---	---	---
		Right	L	22.62	23.00	1.09	---	---	---	---
			M	22.40	23.00	1.15	0.04	---	0.05	---
			H	22.67	23.00	1.08	---	---	---	---
QPSK 50% RB	Limb	Back	L	22.72	23.00	1.07	---	---	---	---
			M	22.45	23.00	1.14	0.11	---	0.13	---
			H	22.81	23.00	1.04	---	---	---	---
		Front	L	22.72	23.00	1.07	---	---	---	---
			M	22.45	23.00	1.14	0.18	---	0.21	---
			H	22.81	23.00	1.04	---	---	---	---
		Top	L	22.72	23.00	1.07	---	---	---	---
			M	22.45	23.00	1.14	0.10	---	0.11	---
			H	22.81	23.00	1.04	---	---	---	---
		Bottom	L	22.72	23.00	1.07	---	---	---	---
			M	22.45	23.00	1.14	0.31	---	0.35	---
			H	22.81	23.00	1.04	---	---	---	---

		Left	L	22.72	23.00	1.07	---	---	---	---
			M	22.45	23.00	1.14	0.02	---	0.02	---
			H	22.81	23.00	1.04	---	---	---	---
		Right	L	22.72	23.00	1.07	---	---	---	---
			M	22.45	23.00	1.14	0.03	---	0.03	---
			H	22.81	23.00	1.04	---	---	---	---

Mode: LTE CAT-M Band 4

fL (MHz)=829 MHz fM (MHz)=836.5MHz fH (MHz)= 844MHz

Limit of SAR (W/kg) : <4W/kg (10g Average)

Test case				Meas power(dBm)	Tune-up(dBm)	Scaling factor	Meas SAR(w/kg)		Report SAR(w/kg)	
Mode	Exposure condition	Position	Channel				First	Second	First	Second
QPSK 1RB	Limb	Back	L	22.27	22.50	1.05	---	---	---	---
			M	22.27	22.50	1.05	0.44	---	0.46	---
			H	22.32	22.50	1.04	---	---	---	---
		Front	L	22.27	22.50	1.05	---	---	---	---
			M	22.27	22.50	1.05	0.47	---	0.49	---
			H	22.32	22.50	1.04	---	---	---	---
		Top	L	22.27	22.50	1.05	---	---	---	---
			M	22.27	22.50	1.05	0.10	---	0.11	---
			H	22.32	22.50	1.04	---	---	---	---
		Bottom	L	22.27	22.50	1.05	---	---	---	---
			M	22.27	22.50	1.05	0.25	---	0.26	---
			H	22.32	22.50	1.04	---	---	---	---
		Left	L	22.27	22.50	1.05	---	---	---	---
			M	22.27	22.50	1.05	0.06	---	0.06	---
			H	22.32	22.50	1.04	---	---	---	---
		Right	L	22.27	22.50	1.05	---	---	---	---
			M	22.27	22.50	1.05	0.27	---	0.28	---
			H	22.32	22.50	1.04	---	---	---	---
QPSK 50% RB	Limb	Back	L	22.33	22.50	1.04	---	---	---	---
			M	22.25	22.50	1.06	0.40	---	0.42	---
			H	22.32	22.50	1.04	---	---	---	---
		Front	L	22.33	22.50	1.04	---	---	---	---
			M	22.25	22.50	1.06	0.43	---	0.46	---

			H	22.32	22.50	1.04	---	---	---	---
		Top	L	22.33	22.50	1.04	---	---	---	---
			M	22.25	22.50	1.06	0.09	---	0.10	---
			H	22.32	22.50	1.04	---	---	---	---
		Bottom	L	22.33	22.50	1.04	---	---	---	---
			M	22.25	22.50	1.06	0.23	---	0.24	---
			H	22.32	22.50	1.04	---	---	---	---
		Left	L	22.33	22.50	1.04	---	---	---	---
			M	22.25	22.50	1.06	0.05	---	0.05	---
			H	22.32	22.50	1.04	---	---	---	---
		Right	L	22.33	22.50	1.04	---	---	---	---
			M	22.25	22.50	1.06	0.24	---	0.25	---
			H	22.32	22.50	1.04	---	---	---	---

Mode: LTE CAT-M Band 12

fL (MHz)=704 MHz fM (MHz)=707.5MHz fH (MHz)= 711MHz

Limit of SAR (W/kg): <4W/kg (10g Average)

Test case				Meas power(dBm)	Tune-up(dBm)	Scaling factor	Meas SAR(w/kg)		Report SAR(w/kg)	
Mode	Exposure condition	Position	Channel				First	Second	First	Second
QPSK 1RB	Limb	Back	L	23.07	23.50	1.10	---	---	---	---
			M	23.01	23.50	1.12	0.10	---	0.11	---
			H	22.97	23.50	1.13	---	---	---	---
		Front	L	23.07	23.50	1.10	---	---	---	---
			M	23.01	23.50	1.12	0.08	---	0.09	---
			H	22.97	23.50	1.13	---	---	---	---
		Top	L	23.07	23.50	1.10	---	---	---	---
			M	23.01	23.50	1.12	0.13	---	0.15	---
			H	22.97	23.50	1.13	---	---	---	---
		Bottom	L	23.07	23.50	1.10	---	---	---	---
			M	23.01	23.50	1.12	0.10	---	0.11	---
			H	22.97	23.50	1.13	---	---	---	---
		Left	L	23.07	23.50	1.10	---	---	---	---
			M	23.01	23.50	1.12	0.07	---	0.08	---
			H	22.97	23.50	1.13	---	---	---	---
		Right	L	23.07	23.50	1.10	---	---	---	---

			M	23.01	23.50	1.12	0.06	---	0.07	---
			H	22.97	23.50	1.13	---	---	---	---
QPSK 50% RB	Limb	Back	L	21.98	22.50	1.13	---	---	---	---
			M	22.04	22.50	1.11	0.09	---	0.10	---
			H	22.01	22.50	1.12	---	---	---	---
		Front	L	21.98	22.50	1.13	---	---	---	---
			M	22.04	22.50	1.11	0.07	---	0.08	---
			H	22.01	22.50	1.12	---	---	---	---
		Top	L	21.98	22.50	1.13	---	---	---	---
			M	22.04	22.50	1.11	0.12	---	0.13	---
			H	22.01	22.50	1.12	---	---	---	---
		Bottom	L	21.98	22.50	1.13	---	---	---	---
			M	22.04	22.50	1.11	0.11	---	0.12	---
			H	22.01	22.50	1.12	---	---	---	---
		Left	L	21.98	22.50	1.13	---	---	---	---
			M	22.04	22.50	1.11	0.07	---	0.08	---
			H	22.01	22.50	1.12	---	---	---	---
		Right	L	21.98	22.50	1.13	---	---	---	---
			M	22.04	22.50	1.11	0.05	---	0.06	---
			H	22.01	22.50	1.12	---	---	---	---

Mode: BT

SAR Values Limit of SAR (W/kg): 4.0W/kg (10g Average)

MAX power(dBm)	Limbs SAR(w/kg)
-6.0	0.004

- *(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)*]·[$\sqrt{f_{(GHz)}}/x$] W/kg for *test separation distances* ≤ 50 mm;

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

Mode: Wi-Fi 2.4GHz

fL (MHz)=2412MHz fM (MHz)=2437MHz fH (MHz)= 2462MHz

Limit of SAR (W/kg): <4W/kg (10g Average)

Test case				Meas power (dBm)	Tune-up (dBm)	Scaling factor	Duty factor	Meas SAR(w/kg)		Report SAR(w/kg)	
Mode	Exposure condition	Position	Channel					First	Second	First	Second
802.11b	Limb	Back	L	15.26	15.50	1.06	1.01	---	---	---	---
			M	14.82	15.50	1.17	1.01	0.17	---	0.20	---
			H	14.52	15.50	1.25	1.01	---	---	---	---
		Front	L	15.26	15.50	1.06	1.01	---	---	---	---
			M	14.82	15.50	1.17	1.01	0.21	---	0.25	---
			H	14.52	15.50	1.25	1.01	---	---	---	---
		Top	L	15.26	15.50	1.06	1.01	---	---	---	---
			M	14.82	15.50	1.17	1.01	0.26	---	0.31	---
			H	14.52	15.50	1.25	1.01	---	---	---	---
		Bottom	L	15.26	15.50	1.06	1.01	---	---	---	---
			M	14.82	15.50	1.17	1.01	0.11	---	0.13	---
			H	14.52	15.50	1.25	1.01	---	---	---	---
		Left	L	15.26	15.50	1.06	1.01	---	---	---	---
			M	14.82	15.50	1.17	1.01	0.05	---	0.06	---
			H	14.52	15.50	1.25	1.01	---	---	---	---
		Right	L	15.26	15.50	1.06	1.01	---	---	---	---
			M	14.82	15.50	1.17	1.01	0.16	---	0.19	---
			H	14.52	15.50	1.25	1.01	---	---	---	---

6.6 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

6.7 Simultaneous Transmission SAR Analysis

Exposure Position	Position	Mode	simultaneous Report SAR (w/kg)	Highest SAR Result	Limit (W/kg)	Result
Limb	Back	LTE CAT-M Band4+WLAN2.4GHz	0.67	0.74	4.0	Pass
	Front	LTE CAT-M Band4+WLAN2.4GHz	0.74			
	Top	LTE CAT-M Band12+WLAN2.4GHz	0.45			
	Bottom	LTE CAT-M Band2+WLAN2.4GHz	0.52			
	Left	LTE CAT-M Band12+WLAN2.4GHz	0.13			
	Right	LTE CAT-M Band4+WLAN2.4GHz	0.47			

According to the above tables, SAR values＜4W/kg meet the compliance.

7 MEASUREMENT UNCERTAINTY

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

(3 - 6 GHz range)

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

8 TEST EQUIPMENTS

The measurements were performed using an automated near-field scanning system, DASY5, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements was the ‘advanced extrapolation’ algorithm.

The following table lists calibration dates of SPEAG components:

Test Equipment	Model	Serial Number	Calibration date	Calibration Due data
DAE	DAE4	546	2021.08.25	2022.08.24
DAE	DAE4	720	2021.10.08	2022.10.07
Dosimetric E-field Probe	ES3DV3	3127	2021.08.27	2022.08.26
Dipole Validation Kit	D750V3	1101	2020.10.16	2023.10.15
Dipole Validation Kit	D835V2	4d023	2020.10.16	2023.10.15
Dipole Validation Kit	D900V2	171	2020.09.17	2023.09.16
Dipole Validation Kit	D1800V2	2d084	2020.09.18	2023.09.17
Dipole Validation Kit	D2000V2	1009	2020.10.14	2023.10.13
Dipole Validation Kit	D2450V2	738	2020.10.13	2023.10.12
Dipole Validation Kit	D2600V2	1166	2019.11.08	2022.11.07
Dipole Validation Kit	D5GHzV2	1079	2020.10.10	2023.10.09

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration date	Calibration Due data
Signal Generator	E4428C	MY45280865	2021.08.20	2022.08.19
Signal Generator	SML 03	103514	2021.08.20	2022.08.19
Power meter	E4417A	MY45101182	2021.08.20	2022.08.19
Power meter	E4417A	MY45101004	2021.08.20	2022.08.19
Power Sensor	E4412A	MY41502214	2021.08.20	2022.08.19
Power Sensor	E4412A	MY41502130	2021.08.20	2022.08.19
Power Sensor	E9300B	MY41496001	2021.08.20	2022.08.19
Power Sensor	E9300B	MY41496003	2021.08.20	2022.08.19
Communication Tester	E5515C	MY48367401	2021.08.20	2022.08.19
Communication Tester	CMW500	161702	2021.08.20	2022.08.19
Communication Tester	MT8820C	6201300660	2021.08.20	2022.08.19
Communication Tester	MT8821C	6201547819	2021.08.20	2022.08.19
Vector Network Analyzer	VNA R140	0011213	2021.09.18	2022.09.17
Dielectric Parameter Probe	DAKS-3.5	1042	2021.09.17	2022.09.16
Vector Network Analyzer	E5071C	MY43030474	2021.08.20	2022.08.19
Calibration Kit	85054D	MY39200751	2021.08.20	2022.08.19

Detailed information of Isotropic E-field Probe Type EX3DV4

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Optical Surface Detection	± 0.3 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Dynamic Range	10 μW/g to > 100 W/kg Linearity: ± 0.2 dB (noise: typically < 1 μW/g)
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

According to KDB 865664 D01 section 3.2.2, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the **SAR target**, **impedance** and **return loss** of a dipole have remain stable according to the following requirements.

1) The test laboratory must ensure that the required supporting information and documentation are included in the SAR report to qualify for the three-year extended calibration interval; otherwise, the IEEE Std 1528-2013 recommended annual calibration applies.
2) Immediate re-calibration is required for the following conditions.
a) After a dipole is damaged and properly repaired to meet required specifications.
b) When the measured SAR deviates from the calibrated SAR value by more than 10% due to changes in physical, mechanical, electrical or other relevant dipole conditions; i.e., the error is not introduced by incorrect measurement procedures or other issues relating to the SAR measurement system.
c) When the most recent return-loss result, measured at least annually, deviates by more than 20% from the previous measurement (i.e. value in dB×0.2) or not meeting the required 20 dB minimum return-loss requirement.
d) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, deviates by more than 5 Ω from the previous measurement

Dipole

SAR target

Refers to system check, measured SAR (1g and 10g) deviates from the Target SAR value of calibration report within 10%.

Impedance and Return loss measured by Network analyzer

The most recent measurement of the real or imaginary parts of the impedance deviates within 5 Ω from the previous measurement. (Data from the last calibration report)

The most recent return-loss result deviates within 20% from the previous measurement. (Data from the last calibration report)

Dipole450 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	59.1Ω+0.06jΩ	55.5Ω+6.40jΩ
Return loss	-21.6 dB	-21.9 dB

Dipole750 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	53.8Ω-4.02jΩ	53.7Ω-1.63jΩ
Return loss	-25.5 dB	-28.2dB

Dipole835 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	54.5Ω-6.16jΩ	52.6Ω-2.37jΩ
Return loss	-34.1 dB	-29.3dB

Dipole900 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	53.0Ω-5.24jΩ	49.1Ω-6.69jΩ
Return loss	-23.2 dB	-23.4dB

Dipole1450 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	54.7Ω+3.95jΩ	52.4Ω-1.35jΩ
Return loss	-33.1 dB	-31.5dB

Dipole1800 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	44.2Ω+5.06jΩ	48.9Ω-2.71jΩ
Return loss	-31.8 dB	-30.6dB

Dipole2000 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.9Ω-3.37jΩ	49.4Ω-2.46jΩ
Return loss	-28.4 dB	-31.9dB

Dipole2450 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	53.2Ω-9.98jΩ	53.3Ω+6.38jΩ
Return loss	-19.9 dB	-23.1dB

Dipole2600 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	50.4Ω+6.71jΩ	47.9Ω-7.80jΩ
Return loss	-23.5 dB	-21.7dB

Dipole3500 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	53.3Ω-10.48jΩ	52.6Ω+3.5jΩ
Return loss	-29.5 dB	-27.4dB

Dipole3700 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	46.0Ω+6.99jΩ	48.3Ω+1.1jΩ
Return loss	-34.5 dB	-33.6dB

Dipole3900 TSL Parameters (3900MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.8Ω-11.48jΩ	48.3Ω-4.9jΩ
Return loss	-28.7 dB	-25.6dB

Dipole3900 TSL Parameters (4100MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.6Ω+9.70jΩ	59.0Ω-0.8jΩ
Return loss	-17.1 dB	-21.6dB

Dipole4200 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	43.9Ω+1.52jΩ	48.3Ω+1.10jΩ

Return loss	-33.5 dB	-33.6dB

Dipole4600 TSL Parameters (4500MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	46.0Ω-1.14jΩ	46.4Ω-4.5jΩ
Return loss	-27.2 dB	-24.5dB

Dipole4600 TSL Parameters (4600MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	49.0Ω-7.87jΩ	51.8Ω-6.35jΩ
Return loss	-20.7 dB	-23.8dB

Dipole4600 TSL Parameters (4700MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	55.0Ω+0.91jΩ	55.9Ω-3.20jΩ
Return loss	-26.2 dB	-24.0dB

Dipole4900 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	45.8Ω-1.40jΩ	50.6Ω-5.2jΩ
Return loss	-26.7 dB	-25.7dB

Dipole5GHz TSL Parameters (5200MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.2Ω+13.89jΩ	50.2Ω-10.0jΩ
Return loss	-17.0 dB	-20.0dB

Dipole5GHz TSL Parameters (5300MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	52.0Ω-11.40jΩ	47.2Ω-7.33jΩ
Return loss	-18.4 dB	-21.9dB

Dipole5GHz TSL Parameters (5500MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.6Ω+6.61jΩ	52.0Ω-7.96jΩ
Return loss	-18.6 dB	-21.9dB

Dipole5GHz TSL Parameters (5600MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	53.6Ω+7.31jΩ	55.7Ω-3.78jΩ
Return loss	-22.1 dB	-23.8dB

Dipole5GHz TSL Parameters (5800MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.6Ω-5.96jΩ	53.7Ω-5.87jΩ
Return loss	-19.0 dB	-23.5dB