



SAR EVALUATION REPORT

**FCC 47 CFR § 2.1093
IEC/IEEE 62209-1528:2020**

For
Wireless Charger

**FCC ID: 2ADNG-YND1800
Model Name: YND-1800**

**Report Number: R15339687-S1
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Prepared for
**Energous Corporation
3590 North First Street, Suite 210
San Jose, CA 95134**

Prepared by
**UL LLC
12 LABORATORY DR
RTP, NC 27709, U.S.A.
TEL: (919) 549-1400**



Revision History

Rev.	Date	Revisions	Revised By
V1	2024-07-03	Initial Issue	--
V2	2024-08-15	Updated §1 equipment class to DTS.	Lindsay Ryan

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1. Attestation of Test Results

Applicant Name	Energous Corporation	
FCC ID	2ADNG-YND1800	
Model Name	YND-1800	
Applicable Standards	Published RF exposure KDB procedures IEC/IEEE 62209-1528:2020	
Exposure Category	SAR Limits (W/Kg)	
	Peak spatial-average (1g of tissue)	
General population / Uncontrolled exposure	1.6	
RF Exposure Conditions	Equipment Class - Highest Reported SAR (W/kg)	
	8CC	DTS
Body-worn	1.023	0.528
Simultaneous TX	1.551	1.551
Date Tested	2024-06-10 to 2024-06-12	
Test Results	Pass	
UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report. This report contains data provided by the customer which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer. The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the U.S. Government.		
Approved & Released By:	Prepared By:	
		
Richard Jankovics Operations Leader UL LLC	Lindsay Ryan Engineer UL LLC	

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEC/IEEE 62209-1528:2020, the following FCC Published RF exposure [KDB](#) procedures:

- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 680106 D01 RF Exposure Wireless Charging Apps v04
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02

In addition to the above, the following information was used:

- TCB Workshop October 2016; RF Exposure Procedures (DUT Holder Perturbations)
- TCB Workshop April 2019; RF Exposure Procedures (Tissue Simulating Liquids (TSL))

3. Facilities and Accreditation

UL LLC is accredited by A2LA, cert. # 0751.06 for all testing performed within the scope of this report. Testing was performed at the locations noted below.

The test sites and measurement facilities used to collect data are located at 2800 Perimeter Park Dr, Morrisville, NC, USA.

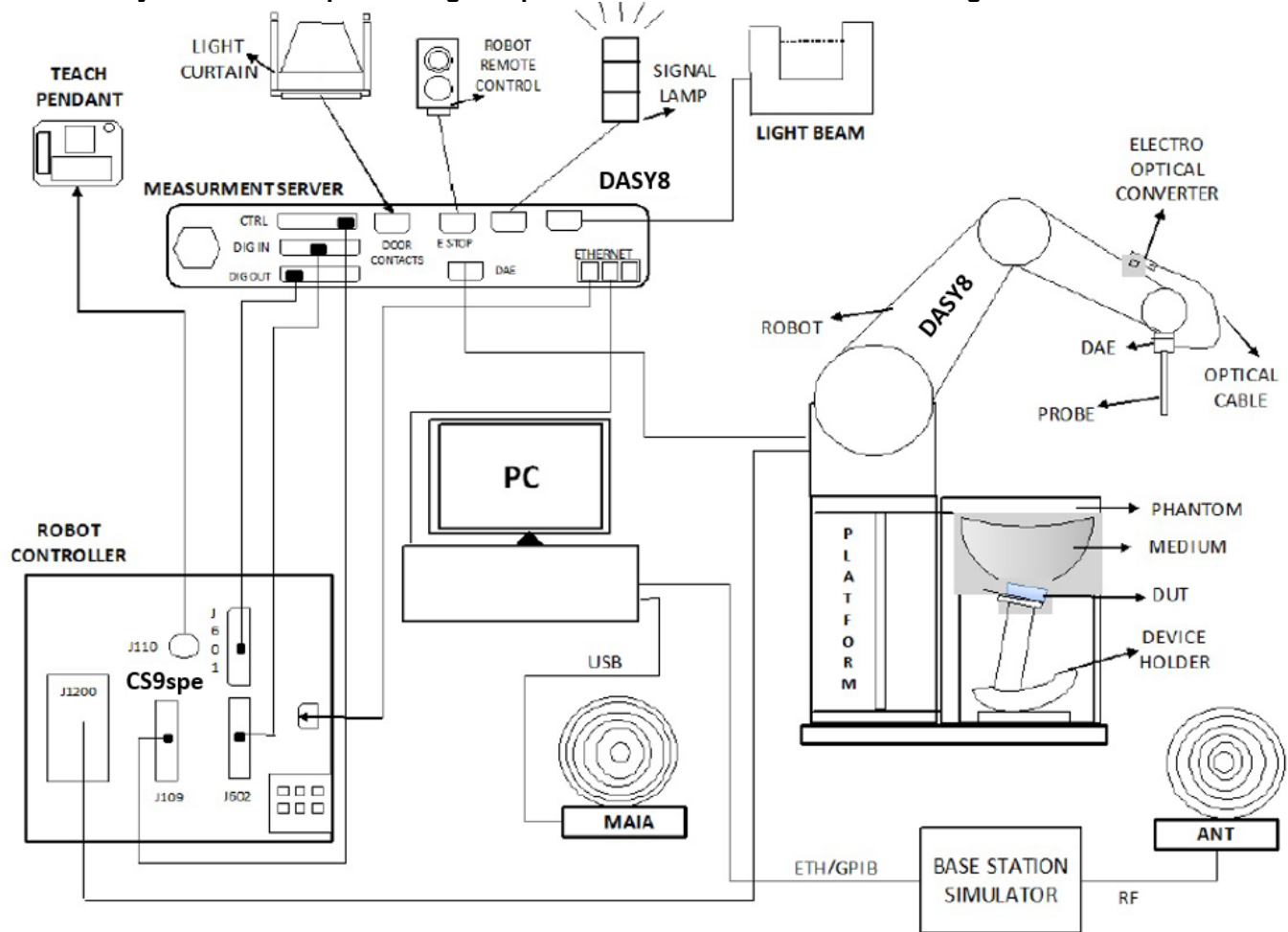
- SAR Lab 2A

	Address	ISED CABID	ISED Company Number	FCC Registration
☐	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

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



- A standard high precision 6-axis robot 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 Win10 and the DASY8¹ 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.

¹ DASY8 software used: DASY16.2.4.2524 and older generations.

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEC/IEEE 62209-1528, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$	≤ 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 $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			≤ 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: $\Delta z_{\text{Zoom}}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <u>reported</u> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Date	Cal. Due Date
Network Analyzer	Keysight	E5063A	MY54100681	2023-08-04	2024-08-04
Dielectric Probe	SPEAG	DAKS-3.5	1051	2023-10-25	2024-10-25
Shorting Block	SPEAG	DAK-3.5 Short	SM DAK 200 DA	2023-10-25	2024-10-25
Thermometer	Fisher Scientific	15-078-181	1817705017	2024-03-29	2026-03-29

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Date	Cal. Due Date
Signal Generator	Keysight	N5181A	MY50140788	2023-08-03	2024-08-03
RF Power Meter	Keysight	N1912A	MY55136012	2023-08-04	2024-08-04
RF Power Sensor	Keysight	N1921A	MY55090025	2023-08-21	2024-08-21
RF Power Sensor	Keysight	N1921A	MY55090030	2023-06-26	2024-06-26
Amplifier	Mini-Circuits	ZVA-183WA-S+	S C484802241	N/A	N/A
Directional Coupler	Mini-Circuits	ZUDC10-183+	2214	NA	NA
Dual Directional Coupler	Werlatone	C5100-10	92249	N/A	N/A
DC Power Supply	Miteq	PS 15V1	1990186	N/A	N/A

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Date	Cal. Due Date
E-Field Probe	SPEAG	EX3DV4	7711	2024-03-15	2025-03-15
Data Acquisition Electronics	SPEAG	DAE4	1716	2024-03-13	2025-03-13
System Validation Dipole	SPEAG	D900V2	1d180	2023-10-19	2024-10-19
System Validation Dipole	SPEAG	D2450V2	963	2023-10-20	2024-10-20
Environmental Indicator	Fisher Scientific	Traceable	240072459	2024-01-24	2026-01-24

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Date	Cal. Due Date
3-Path Diode Power Sensor	Rohde & Schwarz	NRP8S	112236	2023-06-03	2024-06-30
3-Path Diode Power Sensor	Rohde & Schwarz	NRP8S	112237	2023-06-03	2024-06-30

5. Measurement Uncertainty

Measurement uncertainty for 300 MHz to 3 GHz

Uncertainty component	Uncertainty Value (±%)	Prob. Dist.	Div.	c_i (1 g)	c_i (10 g)	Std. Unc. 1 g (± %)	Std. Unc. 10 g (± %)
Measurement System							
Probe Calibration	12.00	Normal	2	1	1	6.00	6.00
Probe Calibration Drift	1.70	Rectangular	1.732	1	1	1.0	1.0
Probe Linearity	4.70	Rectangular	1.732	1	1	2.7	2.7
Broadband Signal	3.00	Rectangular	1.732	1	1	1.7	1.7
Probe Isotropy	7.60	Rectangular	1.732	1	1	4.4	4.4
Other Probe+Electronic	0.70	Normal	1	1	1	0.7	0.7
RF Ambient	1.80	Normal	1	1	1	1.8	1.8
Probe Positioning	0.60	Normal	1	0.14	0.14	0.1	0.1
Data Processing	1.20	Normal	1	1	1	1.2	1.2
Phantom and Device Errors							
Conductivity (meas.) ^{DAK}	2.50	Normal	1	0.78	0.71	2.0	1.8
Conductivity (temp.) ^{BB}	3.30	Rectangular	1.732	0.78	0.71	1.5	1.4
Phantom Permittivity	14.00	Rectangular	1.732	0	0	0.0	0.0
Distance DUT - TSL	2.00	Normal	1	2	2	4.0	4.0
Device Positioning	1.00	Normal	1	1	1	1.0	1.0
Device Holder	3.60	Normal	1	1	1	3.6	3.6
DUT Modulation ^m	2.40	Rectangular	1.732	1	1	1.4	1.4
Time-average SAR	1.70	Rectangular	1.732	1	1	1.0	1.0
DUT Drift	2.50	Normal	1	1	1	2.5	2.5
Val Antenna Unc. ^{val}	0.00	Normal	1	1	1	0.0	0.0
Unc. Input Power ^{val}	0.00	Normal	1	1	1	0.0	0.0
Correction to the SAR results							
Uncertainty in SAR Correction for Deviations in Permittivity and Conductivity	1.90	Normal	1	1	0.84	1.9	1.6
SAR scaling ^p	0.00	Rectangular	1.732	1	1	0.0	0.0
Liquid Conductivity - measurement	-4.70	Normal	1	0.78	0.71	-3.7	-3.3
Combined Standard Uncertainty $U_c(y)$ = RSS						11.6	11.4
Expanded Uncertainty U , Coverage Factor = 2, > 95 % Confidence =						23.2	22.8

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 187 mm x 188 mm x 50 mm	
Test sample information	S/N	Notes
	Yondu 040A	WPT/BLE Radiated
	Yondu 5022	WPT/BLE Radiated
	Inplay-I2C	Receiver
Hardware Version	nrf5x_yondu	
Software Version	6.0.1.19_2200_sdk_17, direct_test_mode_pca100.hex	

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
CW	900 MHz	WPT	30% ¹
Bluetooth	2.4 GHz	LE	62.82% ²

- 1. 30% is the real-world duty cycle for WPT.
- 2. 62.82% duty cycle for Bluetooth LE was achievable by the test tool, however the real-world duty cycle is limited to 18%.

7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

7.1. Required Test Configurations

The table below identifies the standalone test configurations required for this device:

Test Configurations	Front	Edge Top	Edge Right	Edge Bottom	Edge Left	Back ²
WPT	Yes	Yes	Yes	Yes	Yes	No
BLE	Yes	Yes	Yes	Yes	Yes	No

Note(s):

- 1. Yes = Testing is required.
No = Testing is not required.
- 2. This is a wall mounted device; therefore, the rear surface exposure condition is physically inaccessible.

8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

The dielectric constant (ϵ_r) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within $\pm 5\%$ of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for ϵ_r and σ may be relaxed to $\pm 10\%$. This is limited to frequencies $\leq 3\text{ GHz}$.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

Dielectric Property Measurements Results:

SAR Lab	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity (ϵ_r)			Conductivity (σ)		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
2A	2024-06-10	900	Head	900	40.3	41.5	-2.94	0.93	0.97	-4.63
				880	40.4	41.5	-2.72	0.92	0.95	-2.85
				930	40.3	41.5	-2.92	0.94	0.99	-4.70
2A	2024-06-10	2450	Head	2450	37.8	39.2	-3.52	1.76	1.80	-2.00
				2400	37.9	39.3	-3.50	1.73	1.75	-1.46
				2500	37.8	39.1	-3.54	1.80	1.85	-3.02

8.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 $\pm$ 0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be $\geq$ 15.0 cm for SAR measurements $\leq$ 3 GHz and $\geq$ 10.0 cm for measurements $>$ 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
- The dipole input power (forward power) was recorded and the results are normalized to 1 W input power.

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within $\pm 10\%$ of the manufacturer calibrated dipole SAR target. Refer to Appendix B for the SAR System Check Plots.

SAR Lab	Date	Tissue Type	Dipole Type_Serial #	Dipole Cal. Due Date	Dipole Power (dBm)	Measured Results for 1g SAR				Measured Results for 10g SAR				Plot No.
						Zoom Scan	Normalize to 1 W	Target (Ref. Value)	Delta $\pm 10\%$	Zoom Scan	Normalize to 1 W	Target (Ref. Value)	Delta $\pm 10\%$	
2A	2024-06-10	Head	D900V2 SN: 1d180	2024-10-19	17.00	0.530	10.57	11.10	-4.73	0.340	6.78	7.11	-4.59	1
2A	2024-06-10	Head	D2450V2 SN: 963	2024-10-20	17.00	2.700	53.87	53.30	1.07	1.260	25.14	25.10	0.16	2

9. Conducted Output Power Measurements

Tune-Up Power Limits provided by the manufacturer are used to scale measured SAR values.

9.1. Charging Signal

Maximum Output Power (Tune-up Limit) for WPT

Band	Frequency (MHz)	Tune-up PowerLimit (dBm)	
		Chain 0	Chain 1
CW	911.68	30.0	30.0
	913.50	30.0	30.0
	915.50	30.0	30.0

WPT Measured Results

Band	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
		Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
CW	911.68	29.7	30.0	Yes	30.0	30.0	Yes
	913.50	29.7	30.0		30.0	30.0	
	915.50	29.8	30.0		30.0	30.0	

9.2. Bluetooth

Maximum Output Power (Tune-up Limit) for Bluetooth

Band	Mode	Channel	Frequency (MHz)	Tune-up PowerLimit (dBm)	
				Chain 0	Chain 1
Bluetooth 2.4 GHz	LE	0	2402	17.2	17.2
		19	2440	17.6	17.6
		39	2480	13.8	13.8

Bluetooth Measured Results

Band	Mode	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
Bluetooth 2.4 GHz	LE, GFSK	0	2402	16.6	17.2	Yes	17.2	17.2	Yes
		19	2440	17.1	17.6		17.6	17.6	
		39	2480	13.2	13.8		13.8	13.8	

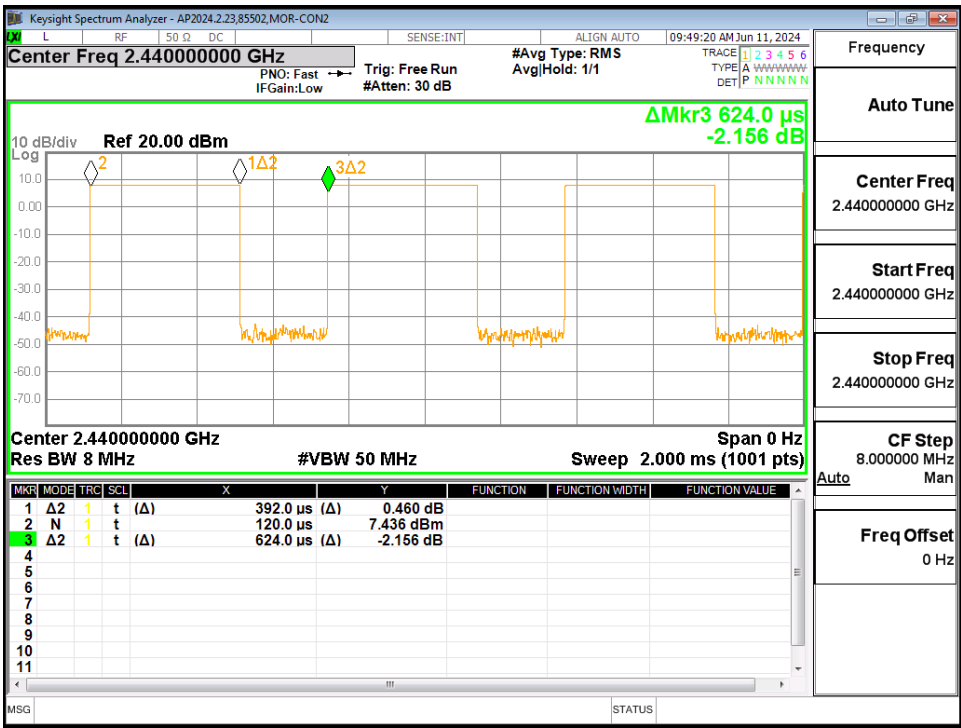
Duty Factor Measured Results

Mode	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
GFSK	0.392	0.624	62.82%	1.59

Note(s):

Duty Cycle = (T on / period) * 100%

Duty Cycle plots
GFSK



10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for Bluetooth = Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = Real-World Duty Cycle / Duty Cycle During Measurement (%)

Note: The real-world Bluetooth duty cycle is protocol limited to 18%.

KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

10.1. WPT

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up Limit	Meas.	Meas.	Scaled	
Body-Worn	CW	MIMO	0	Front	911.7	30.0	29.9	0.847	0.867	1
					913.5	30.0	29.9	0.914	0.935	
					915.5	30.0	29.9	1.000	1.023	
				Edge Top	913.5	30.0	29.9	0.097	0.099	
				Edge Right	913.5	30.0	29.9	0.057	0.058	
				Edge Bottom	913.5	30.0	29.9	0.075	0.077	
				Edge Left	913.5	30.0	29.9	0.076	0.078	

Note:

- The two antennas are always transmitting in MIMO mode simultaneously; therefore, the mean of the two chain's measured output power was used since the emissions are overlapping between the two antennas.

10.2. Bluetooth

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle Scaling Factor	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	
Body-Worn	BLE GFSK	MIMO	0	Front	19	2440.0	0.287	17.6	17.4	1.760	0.528	2
				Edge Top	19	2440.0	0.287	17.6	17.4	0.026	0.008	
				Edge Right	19	2440.0	0.287	17.6	17.4	0.021	0.006	
				Edge Bottom	19	2440.0	0.287	17.6	17.4	0.029	0.009	
				Edge Left	19	2440.0	0.287	17.6	17.4	0.016	0.005	

Note:

- The two antennas are always transmitting in MIMO mode simultaneously; therefore, the mean of the two chain's measured output power was used since the emissions are overlapping between the two antennas.

11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), 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 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).
- 4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	First Repeated		Second Repeated		Third Repeated
						Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)
900	CW	Body	Front	Yes	0.914	0.914	1.00	N/A	N/A	N/A
2450	BLE	Body	Front	Yes	1.760	1.720	1.02	N/A	N/A	N/A

12. Simultaneous Transmission Conditions

RF Exposure Condition	Item	Capable Transmit Configurations	
Body-Worn	1	WPT	+ BLE

12.1. Simultaneous transmission SAR test exclusion considerations

KDB 447498 D01 General RF Exposure Guidance provides two procedures for determining simultaneous transmission SAR test exclusion: Sum of SAR and SAR to Peak Location Ratio (SPLSR)

Sum of SAR

To qualify for simultaneous transmission SAR test exclusion based upon Sum of SAR the sum of the reported standalone SARs for all simultaneously transmitting antennas shall be below the applicable standalone SAR limit. If the sum of the SARs is above the applicable limit then simultaneous transmission SAR test exclusion may still apply if the requirements of the SAR to Peak Location Ratio (SPLSR) evaluation are met.

12.2. Sum of the SAR for WPT & BLE

RF Exposure conditions	Test Position	Body-Worn SAR (W/kg)		Σ 1-g SAR (W/kg)
		1	2	1+2
		CW (WPT)	BLE	
Body-Worn	Front	1.023	0.528	1.551

Appendixes

Refer to separated files for the following appendixes.

Appendix A: SAR Setup Photos

Appendix B: SAR System Check Plots

Appendix C: SAR Highest Test Plots

Appendix D: SAR Tissue Ingredients

Appendix E: SAR Probe Certificates

Appendix F: SAR Dipole Certificates

END OF REPORT