NVLAP LAB CODE 600341-0

FCC SAR TEST REPORT

Applicant: **Guangdong COROS Sports Technology Co., Ltd**

Address: **Room 601,Room 701, Building 2, No. 2, Science and Technology 9 Rd, Songshan Lake Hi Tech Zone, Dongguan City, Guangdong Province, P.R. China**

Product Name: **COROS PACE Pro**

FCC ID: **2BBGF-W332**

Standard(s): **47 CFR Part 2(2.1093)**

Report Number: **2402W91377E-20A**

Report Date: **2024/10/18**

The above device has been tested and found compliant with the requirement of the relative standards by Bay Area Compliance Laboratories Corp. (Dongguan).

Mark Dong

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Title: SAR Engineer

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SAR TEST RESULTS SUMMARY

Mode		Max. Reported SAR Level(s) (W/kg)		Limit (W/kg)
Limb Mode	**WLAN 2.4G**	10g Extremity SAR	**0.79**	4.0
	BT	10g Extremity SAR	0.06	

Applicable Standards	**FCC 47 CFR part 2.1093** Radiofrequency radiation exposure evaluation: portable devices
	IEEE1528:2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
	IEC 62209-2:2010 +AMD1:2019 Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices-Human models, instrumentation, and procedures-Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)
	KDB procedures KDB 447498 D01 General RF Exposure Guidance v06 KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04 KDB 865664 D02 RF Exposure Reporting v01r02 KDB 248227 D01 802.11 Wi-Fi SAR v02r02

Note: This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in **FCC 47 CFR part 2.1093** and has been tested in accordance with the measurement procedures specified in IEEE 1528-2013 and RF exposure KDB procedures.
The results and statements contained in this report pertain only to the device(s) evaluated.

CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	2402W91377E-20A	Original Report	2024/10/18

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Name:	COROS PACE Pro
EUT Model:	W332
Device Type:	Portable
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	Internal Antenna
Body-Worn Accessories:	None
Operation Modes:	WLAN, Bluetooth, BLE
Frequency Band:	WLAN 2.4G: 2412-2462 MHz(TX/RX) Bluetooth/BLE: 2402-2480MHz(TX/RX)
Maximum Output Power	WLAN 2.4G: 16.32 dBm Bluetooth(BDR/EDR): 5.46 dBm BLE: 8.25 dBm
Rated Input Voltage:	DC 3.87V from Rechargeable Battery
Serial Number:	2QZ5-1
Normal Operation:	Limbs
EUT Received Date:	2024/8/30
Test Date:	2024/10/16
EUT Received Status:	Good

2. REFERENCE, STANDARDS, AND GUIDELINES

FCC:

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

2.1 SAR Limits

FCC Limit

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.6	8
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	**4**	20

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

Occupational/Controlled Environments are defined as locations where there is exposure that maybe incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

General Population/Uncontrolled environments Spatial Peak limit 4W/kg (FCC) for 10g Extremity SAR applied to the EUT.

2.2 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

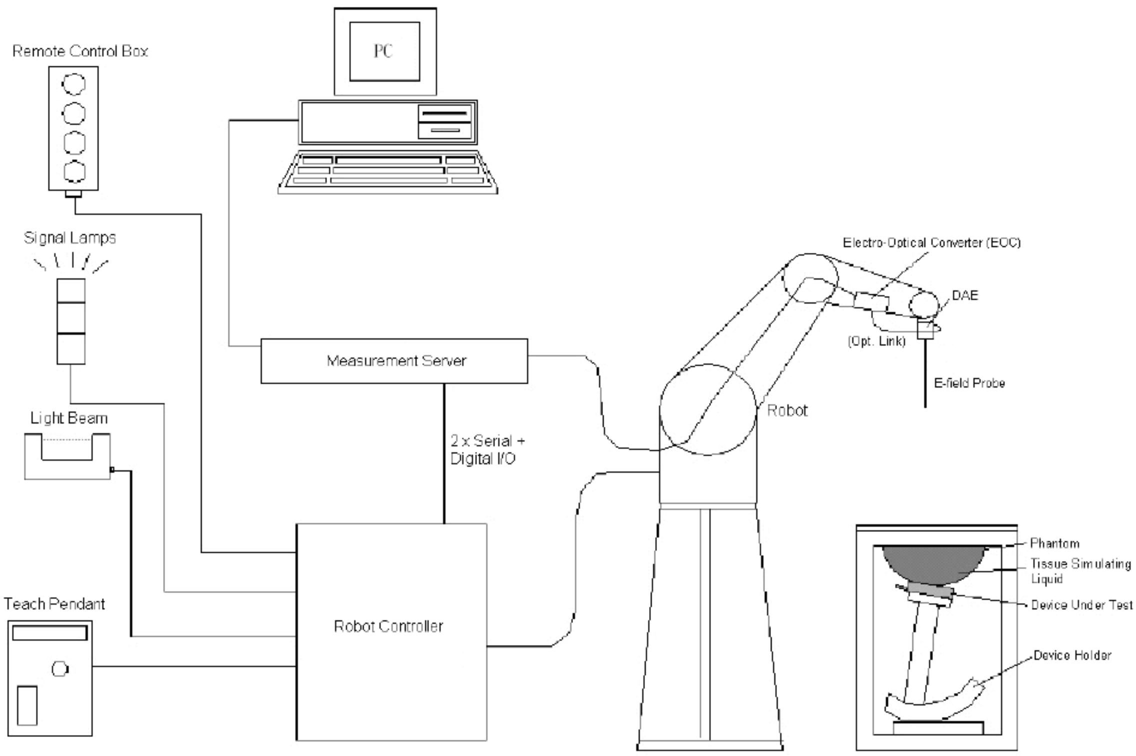
The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. :829273, the FCC Designation No. : CN5044.

3. DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY5 from Schmid & Partner Engineering AG (SPEAG) which is the Fifth generation of the system shown in the figure hereinafter:

DASY5 System Description

The DASY5 system 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 application, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 professional operating system and the DASY52 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.

DASY5 Measurement Server

The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz Intel ULV Celeron, 128MB chip-disk and 128MB RAM. The necessary circuits for communication with the DAE4 (or DAE3) electronics box, as well as the 16 bit AD-converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized point out, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

Data Acquisition Electronics

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

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of both the DAE4 as well as of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

EX3DV4 E-Field Probes

Frequency	4 MHz–10 GHz Linearity: ± 0.2 dB (30 MHz–10 GHz)
Directivity(typical)	± 0.1 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g – > 100 mW/g Linearity: ± 0.2 dB (noise: typically< 1 µW/g)
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
Applications	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%.
Compatibility	DASY3, DASY4, DASY52, DASY6, DASY8, EASY6, EASY4/MRI

SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6 mm). The phantom has three measurement areas:
_ Left Head
_ Right Head
_ Flat phantom

The phantom table for the DASY systems based on the robots have the size of 100 x 50 x 85 cm (L x W x H). For easy dislocation these tables have fork lift cut outs at the bottom.
The bottom plate contains three pairs of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. Only one device holder is necessary if two phantoms are used (e.g., for different liquids)

A white cover is provided to cover the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on top of this phantom cover are possible.
Three reference marks are provided on the phantom counter. These reference marks are used to teach the absolute phantom position relative to the robot.

Robots

The DASY5 system uses the high precision industrial robot. The robot offers the same features important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchrony motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

The above mentioned robots are controlled by the Staubli CS7MB robot controllers. All information regarding the use and maintenance of the robot arm and the robot controller is contained on the CDs delivered along with the robot. Paper manuals are available upon request direct from Staubli.

Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 15mm2 step integral, with 1.5mm interpolation used to locate the peak SAR area used for zoom scan assessments.

Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.

Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the DASY5 software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m^3 is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm,with the side length of the 10g cube is 21.5mm.

When the cube intersects with the surface of the phantom, it is oriented so that 3 vertices touch the surface of the shell or the center of a face is tangent to the surface. The face of the cube closest to the surface is modified in order to conform to the tangent surface.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 7 x7 x 7 (5mmx5mmx5mm) providing a volume of 30 mm in the X & Y & Z axis.

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEC 62209-1:2016

Recommended Tissue Dielectric Parameters for Head liquid

Table A.3 – Dielectric properties of the head tissue-equivalent liquid

Frequency MHz	Relative permittivity ε_r	Conductivity (σ) S/m
300	45,3	0,87
450	43,5	0,87
750	*41,9*	*0,89*
835	41,5	0,90
900	41,5	0,97
1 450	40,5	1,20
1 500	*40,4*	*1,23*
1 640	*40,2*	*1,31*
1 750	*40,1*	*1,37*
1 800	40,0	1,40
1 900	40,0	1,40
2 000	40,0	1,40
2 100	*39,8*	*1,49*
2 300	*39,5*	*1,67*
2 450	39,2	1,80
2 600	*39,0*	*1,96*
3 000	38,5	2,40
3 500	*37,9*	*2,91*
4 000	*37,4*	*3,43*
4 500	*36,8*	*3,94*
5 000	*36,2*	*4,45*
5 200	*36,0*	*4,66*
5 400	*35,8*	*4,86*
5 600	*35,5*	*5,07*
5 800	*35,3*	*5,27*
6 000	*35,1*	*5,48*

NOTE For convenience, permittivity and conductivity values at those frequencies which are not part of the original data provided by Drossos et al. [33] or the extension to 5 800 MHz are provided (i.e. the values shown *in italics*). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6 000 MHz that were linearly extrapolated from the values at 3 000 MHz and 5 800 MHz.

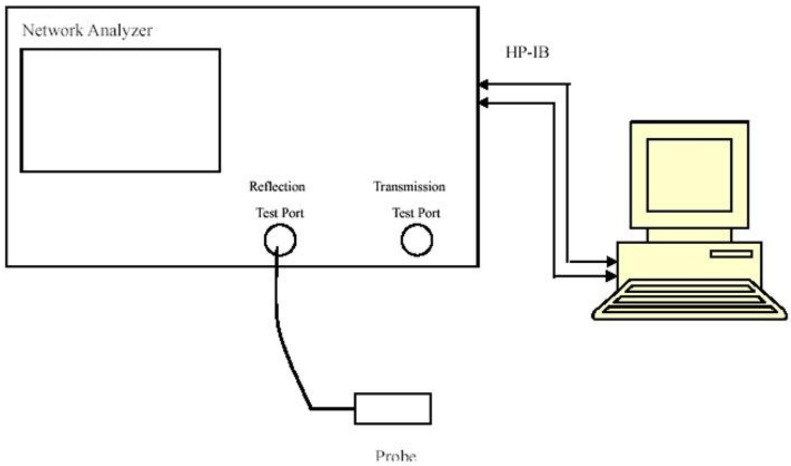
4. EQUIPMENT LIST AND CALIBRATION

4.1 Equipments List & Calibration Information

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52.10	N/A	NCR	NCR
DASY5 Measurement Server	DASY5 4.5.12	1470	NCR	NCR
Data Acquisition Electronics	DAE4	772	2024/1/23	2025/1/22
E-Field Probe	EX3DV4	7783	2024/4/12	2025/4/11
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
Twin SAM	Twin SAM V5.0	1874	NCR	NCR
Dipole, 2450 MHz	D2450V2	971	2024/6/15	2027/6/14
Simulated Tissue Liquid Head	HBBL600-10000V6	SL AAH U16 BC (Batch:220809-1)	Each Time	/
Network Analyzer	8753C	3033A02857	2023/11/18	2024/11/17
Dielectric assessment kit	1253	SM DAK 040 CA	NCR	NCR
synthesized signal generator	8665B	3438a00584	2023/10/18	2024/10/17
EPM Series Power Meter	E4419B	MY45103907	2023/10/18	2024/10/17
USB Wideband Power Sensor	U2022XA	MY54170006	2023/10/18	2024/10/17
Power Amplifier	ZVE-6W-83+	637202210	NCR	NCR
Directional Coupler	441493	520Z	NCR	NCR
Attenuator	20dB, 100W	LN749	NCR	NCR
Attenuator	6dB, 150W	2754	NCR	NCR
Thermometer	DTM3000	3635	2024/8/12	2025/8/11
Hygrothermograph	HTC-2	EM072	2023/11/6	2024/11/5

5. SAR MEASUREMENT SYSTEM VERIFICATION

5.1 Liquid Verification



5.2 Liquid Verification Results

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ε_r	Ơ (S/m)	ε_r	Ơ (S/m)	$\Delta\varepsilon_r$	ΔƠ (S/m)	
2402	Simulated Tissue Liquid Head	40.586	1.796	39.3	1.76	3.27	2.05	±5
2412	Simulated Tissue Liquid Head	40.423	1.817	39.28	1.77	2.91	2.66	±5
2437	Simulated Tissue Liquid Head	40.225	1.856	39.23	1.79	2.54	3.69	±5
2440	Simulated Tissue Liquid Head	40.187	1.874	39.22	1.79	2.47	4.69	±5
2450	Simulated Tissue Liquid Head	40.106	1.882	39.2	1.8	2.31	4.56	±5
2462	Simulated Tissue Liquid Head	40.089	1.896	39.18	1.81	2.32	4.75	±5
2480	Simulated Tissue Liquid Head	40.003	1.899	39.16	1.83	2.15	3.77	±5

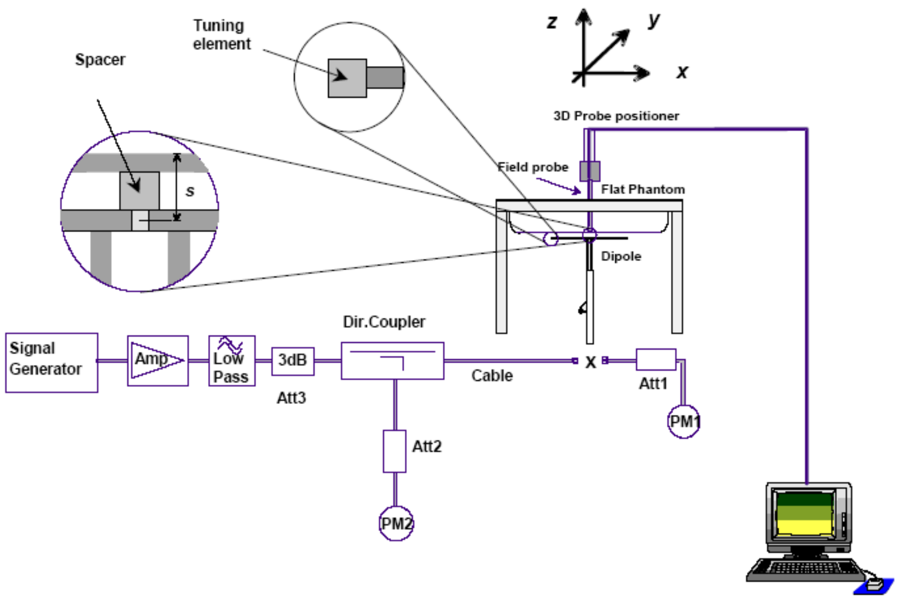
**Liquid Verification above was performed on 2024/10/16.*

5.3 System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

The spacing distances in the **System Verification Setup Block Diagram** is given by the following:
a) s = 15 mm ± 0,2 mm for 300 MHz ≤ f ≤ 1 000 MHz;
b) s = 10 mm ± 0,2 mm for 1 000 MHz < f ≤ 3 000 MHz;
c) s = 10 mm ± 0,2 mm for 3 000 MHz < f ≤ 6 000 MHz.

System Verification Setup Block Diagram



5.4 System Accuracy Check Results

Date	Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
2024/10/16	2450	Simulated Tissue Liquid Head	100	10g	2.41	24.1	24.8	-2.82	±10

Note:
All the SAR values are normalized to 1Watt forward power.

5.5 SAR SYSTEM VALIDATION DATA

System Performance 2450 MHz Head

DUT: D2450V2; Type: 2450 MHz; Serial: SN:971

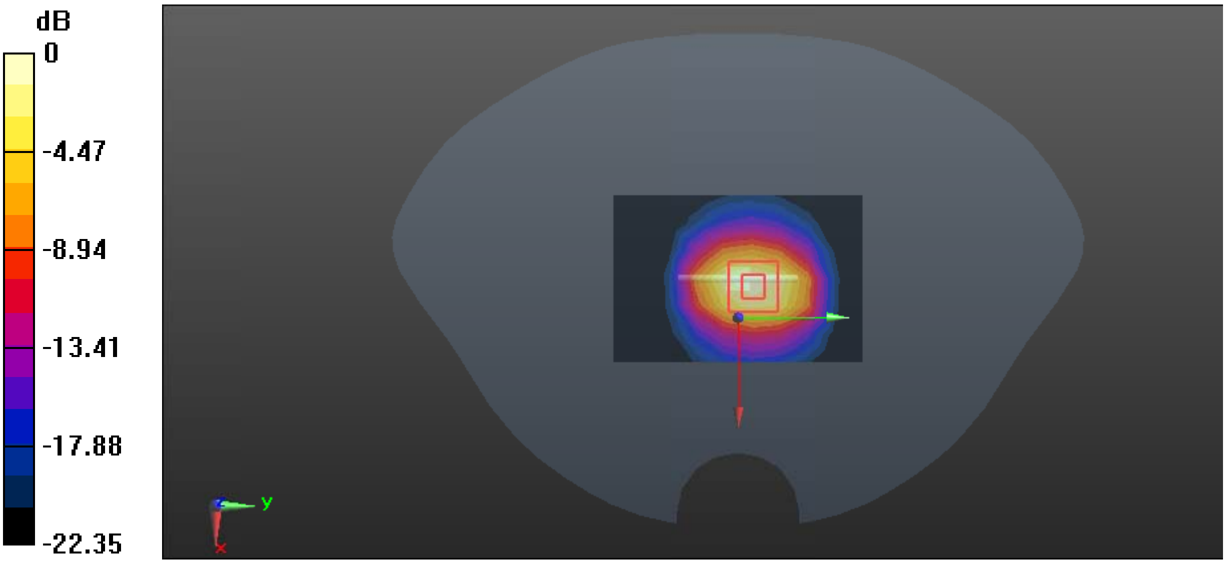
Communication System: CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.882 S/m; ε_r =40.106; ρ = 1000 kg/m^3;
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7783; ConvF(6.85, 6.85, 6.85) @ 2450 MHz; Calibrated: 2024/4/12
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn772; Calibrated: 2024/1/23
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Area Scan(7x10x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 5.47 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =55.92 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 9.16 W/kg
SAR(1 g) = 4.95 W/kg; SAR(10 g) = 2.41 W/kg
Maximum value of SAR (measured) = 5.81 W/kg



0 dB = 5.81 W/kg = 7.64 dBW/kg

6. EUT TEST STRATEGY AND METHODOLOGY

6.1 Test positions for Limb-worn device

A limb-worn device is a unit whose intended use includes being strapped to the arm or leg of the user while transmitting (except in idle mode). It is similar to a body-worn device.
Therefore, the test positions of 6.1.4.4 also apply. The strap shall be opened so that it is divided into two parts as shown in Figure 10. The device shall be positioned directly against the phantom surface with the strap straightened as much as possible and the back of the device towards the phantom.
If the strap cannot normally be opened to allow placing in direct contact with the phantom surface, it may be necessary to break the strap of the device but ensuring to not damage the antenna.

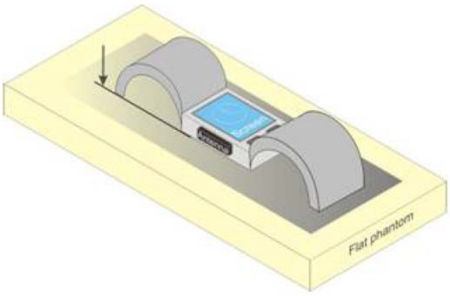


Figure 10 – Test position for limb-worn devices

6.2 Test Distance for SAR Evaluation

For Limb mode(10g Extremity SAR) the EUT(Equipment Under Test) is set directly against the phantom, the test distance is 0mm.

6.3 SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or radiating structures of the EUT, the horizontal grid spacing was 15 mm x 15 mm, and the SAR distribution was determined by integrated grid of 1.5mm x 1.5mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7x 7 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one dimensional splines with the “Not a knot"-condition (in x, y and z-directions). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

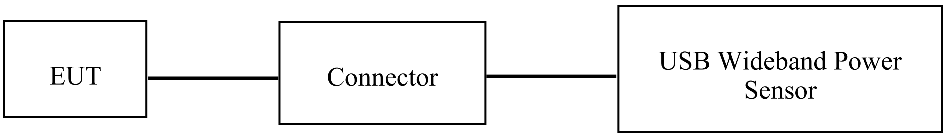
All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

7. CONDUCTED OUTPUT POWER MEASUREMENT

7.1 Test Procedure

The RF output of the transmitter was connected to the input port of the USB Wideband Power Sensor through Connector.



WLAN/BT

7.2 Maximum Target Output Power

Max Target Power(dBm)			
Mode/Band	**Channel**		
	Low	**Middle**	**High**
WLAN 2.4G(802.11b)	16.5	16.5	16.5
WLAN 2.4G(802.11g)	13.5	13.5	13.5
WLAN 2.4G(802.11n ht20)	13.5	13.5	13.5
Bluetooth BDR/EDR	6	4.5	4.5
BLE 1Mbps	8.5	7.5	7
BLE 2Mbps	8.5	7.5	7

7.3 Test Results:

WLAN: 2.4G

Mode	Channel frequency (MHz)	Data Rate	Duty cycle (%)	RF Output Power (dBm)
802.11b	2412	1Mbps	99.40	16.15
	2437	1Mbps	99.40	**16.32**
	2462	1Mbps	99.40	16.02
802.11g	2412	6Mbps	96.54	13.26
	2437	6Mbps	96.54	12.92
	2462	6Mbps	96.54	13.03
802.11n ht20	2412	MCS0	96.26	13.16
	2437	MCS0	96.26	13.31
	2462	MCS0	96.26	13.32

Note: The duty cycle plots, please refer to the radio report: 2402W91377E-RF-00A, which was issued by Bay Area Compliance Laboratories Corp. (Dongguan).

Bluetooth:

Mode	Channel frequency (MHz)	RF Output Power (dBm)
BDR(GFSK)	2402	**5.46**
	2441	4.36
	2480	4.09
EDR(π/4-DQPSK)	2402	4.64
	2441	3.68
	2480	3.09
EDR(8DPSK)	2402	5.40
	2441	4.30
	2480	3.69

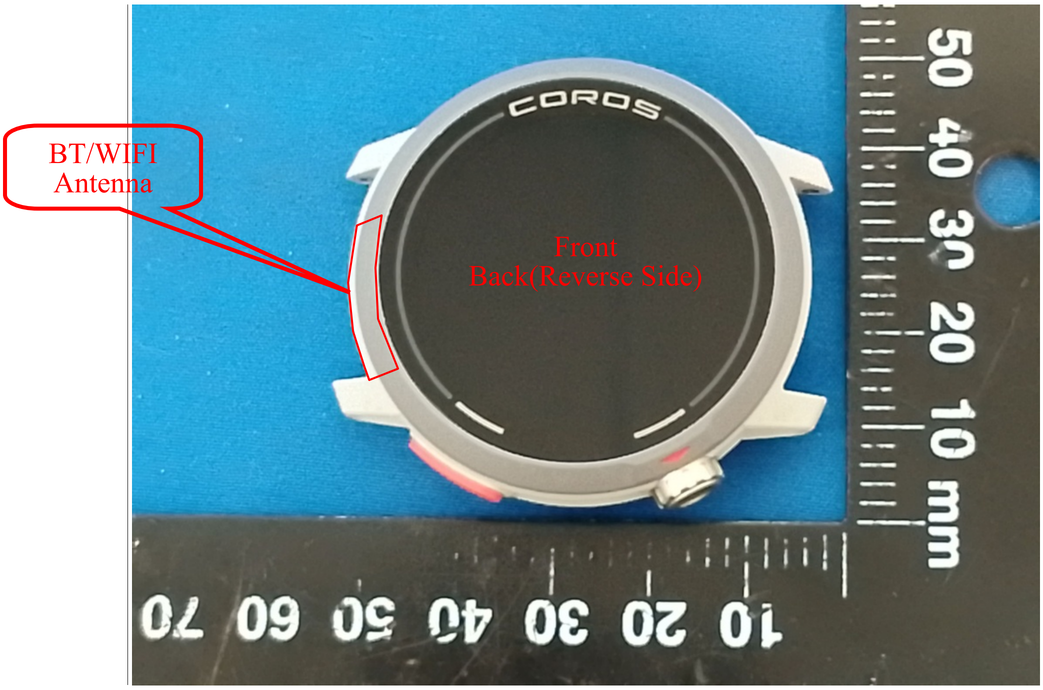
BLE:

Mode	Channel frequency (MHz)	Duty cycle (%)	RF Output Power (dBm)
BLE 1Mbps	2402	62.40	8.22
	2440		7.12
	2480		6.53
BLE 2Mbps	2402	56.75	**8.25**
	2440		7.23
	2480		6.59

Note: The duty cycle plots, please refer to the radio report: 2402W91377E-RF-00C, which was issued by Bay Area Compliance Laboratories Corp. (Dongguan).

8. STANDALONE SAR TEST EXCLUSION CONSIDERATIONS

8.1 Antennas Location:



9. SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

9.1 SAR Test Data

Environmental Conditions

Temperature:	22.2-22.7 ℃
Relative Humidity:	45%
ATM Pressure:	101.1 kPa
Test Date:	2024/10/16

Testing was performed by Petre Ma.

WLAN 2.4G:

Limb Mode:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	10g SAR (W/kg)				
					Scaled Factor	Duty cycle Factor	Meas. SAR	Scaled SAR	Plot
Limb Back (0mm)	2412	802.11b	16.15	16.5	1.084	1.006	0.391	0.43	1#
	2437	802.11b	16.32	16.5	1.042	1.006	0.749	**0.79**	2#
	2462	802.11b	16.02	16.5	1.117	1.006	0.442	0.50	3#

Note:
1. When the 10-g SAR is≤ 2.0W/kg, testing for other channels are optional.
2.When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
3.KDB 248227 D01-SAR measurement is not required for 2.4 GHz OFDM(802.11g/n)when the highest reported SAR for DSSS(802.11b) is ≤ 1.2 W/kg, and the output power for DSSS is not less than that for OFDM.
4. According KDB 248227 D01, for SAR testing of WLAN with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to “1/(duty cycle)”.

BT:

Limb Mode:

EUT Position	Frequency (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	10g SAR (W/kg)				
					Scaled Factor	Duty cycle Factor	Meas. SAR	Scaled SAR	Plot
Limb Back (0mm)	2402	BLE 2Mbps	8.25	8.5	1.059	1.76	0.031	**0.06**	4#
	2440	BLE 2Mbps	7.23	7.5	1.064	1.76	0.030	0.06	5#
	2480	BLE 2Mbps	6.59	7	1.099	1.76	0.022	0.04	6#

Note:
1. When the 10-g SAR is≤ 2.0W/kg, testing for other channels are optional.
2. For BLE 2Mbps mode power is the largest among BLE 1M/2M,GFSK, π/4-DQPSK and 8DPSK, BLE 2Mbps mode as initial test configuration is selected to test.

10. SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

10.1 Simultaneous Transmission:

Note: There is no multiple transmitters for the product, so simultaneous transmission need not to evaluate.

11. DUT HOLDER PERTURBATIONS

In accordance with TCB workshop October 2016:

1) SAR perturbation due to test device holders, depending on antenna locations, buttons locations
on phones or device, form factor (e.g. dongles etc.), the measured SAR could be influenced by the relative positions of the test device and its holder
2) SAR measurement standards have included protocols to evaluate this with a flat phantom, with
and without the device holder
3) When the highest reported SAR of an antenna is > 1.2 W/kg, holder perturbation verification is
required for each antenna, using the highest SAR configuration among all applicable frequency bands in the same exact device and holder positions used for head and body SAR measurements; i.e. same device/button locations in the holder

Per IEEE 1528: 2013/Annex E/E.4.1.1: Device holder perturbation tolerance for a specific test device: Type B

When it is unknown if a device holder perturbs the fields of a test device, the SAR uncertainty shall be
assessed with a flat phantom (see Clause 5) by comparing the SAR with and without the device holder
according to the following tests:

The SAR tolerance for device holder disturbance is computed using Equation (E.21) and entered in the
corresponding row of the appropriate uncertainty table with an assumed rectangular probability distribution and *vi* = ∞ degrees of freedom:

$$SAR_{\text{tolerance}}[\%] = 100 \times \left(\frac{SAR_{\text{w/ holder}} - SAR_{\text{w/o holder}}}{SAR_{\text{w/o holder}}} \right) \quad \text{(E.21)}$$

The Highest Measured SAR Configuration among all applicable Frequency Band

Frequency Band	Freq.(MHz)	EUT Position	Meas. SAR (W/kg)		The Device holder perturbation uncertainty
			With holder	Without holder	
/	/	/	/	/	/

APPENDIX A - MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the measurement system and is given in the following Table.

Measurement uncertainty evaluation for IEEE1528-2013 SAR test

Uncertainty component	Tolerance/ uncertainty ± %	Probability distribution	Divisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration(k=1)	6.55	N	1	1	1	6.6	6.6
Axial isotropy	4.7	R	√3	√0.5	√0.5	1.9	1.9
Hemispherical isotropy	9.6	R	√3	√0.5	√0.5	3.9	3.9
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Linearity	4.7	R	√3	1	1	2.7	2.7
System detection limits	1.0	R	√3	1	1	0.6	0.6
Modulation response	0.0	R	√3	1	1	0.0	0.0
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambientconditions-noise	1.0	R	√3	1	1	0.6	0.6
RF ambient conditions-reflections	1.0	R	√3	1	1	0.6	0.6
Probe positioner mech.tolerance	0.8	R	√3	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Extrapolation, interpolation, and integrationsalgorithms for max. SAR evaluation	2.0	R	√3	1	1	1.2	1.2
Test sample related							
Test sample positioning	3.3	N	1	1	1	3.3	3.3
Device holder uncertainty	4.7	N	1	1	1	4.7	4.7
Output power variation –SAR draft measurement	5.0	R	√3	1	1	2.9	2.9
SAR scaling	2.8	R	√3	1	1	1.6	1.6
Phantom and tissue parameters							
Phantom shell uncertainty–shape, thicknessand permittivity	4.0	R	√3	1	1	2.3	2.3
Uncertainty in SARcorrection for deviationsin permittivity and conductivity	1.9	N	1	1	0.84	1.9	1.6
Liquid conductivity meas.	2.5	N	1	0.78	0.71	2.0	1.8
Liquid permittivity meas.	2.5	N	1	0.23	0.26	0.6	0.7
Liquid conductivity – temperatureuncertainty	1.7	R	√3	0.78	0.71	0.8	0.7
Liquid permittivity – temperatureuncertainty	0.3	R	√3	0.23	0.26	0.0	0.0
Combined standard uncertainty		RSS				12.1	12.0
Expanded uncertainty (95 % confidence interval)		k=2				24.2	24.0

Measurement uncertainty evaluation for IEC62209-2 SAR test

Source of uncertainty	Tolerance/ Uncertainty value ± %	Probability Distribution	Divisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration	6.55	N	1	1	1	6.6	6.6
Isotropy	4.7	R	√3	1	1	2.7	2.7
Linearity	4.7	R	√3	1	1	2.7	2.7
Probe modulation response	0.0	R	√3	1	1	0.0	0.0
Detection limits	1.0	R	√3	1	1	0.6	0.6
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambientconditions – noise	1.0	R	√3	1	1	0.6	0.6
RF ambient conditions–reflections	1.0	R	√3	1	1	0.6	0.6
Probe positioner mech. restrictions	0.8	R	√3	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Post-processing	2.0	R	√3	1	1	1.2	1.2
Test sample related							
Device holder uncertainty	4.7	N	1	1	1	4.7	4.7
Test sample positioning	3.3	N	1	1	1	3.3	3.3
Power scaling	4.5	R	√3	1	1	2.6	2.6
Drift of output power (measured SAR drift)	5.0	R	√3	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	√3	1	1	2.3	2.3
Algorithm for correcting SAR for deviations in permittivity and conductivity	1.9	N	1	1	0.84	1.9	1.6
Liquid conductivity (meas.)	2.5	N	1	0.78	0.71	2.0	1.8
Liquid permittivity (meas.)	2.5	N	1	0.23	0.26	0.6	0.7
Liquid conductivity – temperatureuncertainty	1.7	R	√3	0.78	0.71	0.8	0.7
Liquid permittivity – temperatureuncertainty	0.3	R	√3	0.23	0.26	0.0	0.0
Combined standard uncertainty		RSS				11.8	11.7
Expanded uncertainty (95 % confidence interval)						23.6	23.4

APPENDIX B - SAR PLOTS

Please refer to the attachment.

APPENDIX C - EUT TEST POSITION PHOTOS

Please refer to the attachment.

APPENDIX D - PROBE CALIBRATION CERTIFICATES

Please refer to the attachment.

APPENDIX E - DIPOLE CALIBRATION CERTIFICATES

Please refer to the attachment.

===== END OF REPORT ====