

FCC

SAR EVALUATION REPORT

For

FCC ID : S6J3138

Model : 3138-AX1-US
Series Model : 3138-AS1-US, 3138-AX2-US, 3138-AS2-US

Report Type : Original Report	Product Name : RFID READER
Report Number: <u>RXZ241220075SA03</u>	
Report Date: <u>2025-09-12</u>	
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Facilities: The test site used by Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) to collect test data is located on 70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 221, Taiwan, R.O.C.	

Statement of Compliance

Applicant (Certification Holder)	Technology Solutions (UK) Ltd
	Suite A, Loughborough Technology Centre, Epinal Way, Loughborough, Leicestershire, LE11 3GE, United Kingdom
Brand (Trade) Name	TSL
Product (Equipment) Name	RFID READER
Model Name	3138-AX1-US
Series Model Name	3138-AS1-US, 3138-AX2-US, 3138-AS2-US
HVIN	3138-AX1-US, 3138-AS1-US, 3138-AX2-US, 3138-AS2-US
Model Discrepancy	Please refer to the difference declaration letter provided by the Applicant.

Note : The only difference between the model numbers 3138-AX1-US, 3138-AS1-US and 3138-AX2-US, 3138-AS2-US is the accessory charging connector; this does not affect the test results.

Measurement Procedures and Standards Used:

- ☒ IEC/IEEE62209-1528:2020
- ☒ IEEE 1528-2013
- ☒ FCC 47 CFR part 2.1093
- ☒ KDB 447498 D04 Interim General RF Exposure Guidance v01
- ☒ KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04

The measurement results in this report were performed at Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

Report Issued Date : 2025-09-12

Reviewed By : Anson Lu 

Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ241220075	RXZ241220075SA03	2025.09.12	Original Report	Anson Lu

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EUT RESULTS

Attestation of Test Results for Hand-held SAR			
Frequency Band	Maximum 10g SAR Level(s) Reported(W/kg)		Limit(W/kg)
	Position	Maximum 10g SAR(W/kg)	
RFID(DSB-ASK)	Hand-held SAR	2.383	4.0
RFID(PR-ASK)	Hand-held SAR	2.347	4.0
Attestation of Test Results for Simultaneous SAR with BLE			
Frequency Band	Maximum 10g SAR Level(s) Reported(W/kg)		Limit(W/kg)
	Position	Maximum 10g SAR(W/kg)	
RFID(DSB-ASK)	Hand-held SAR	2.385	4.0
RFID(PR-ASK)	Hand-held SAR	2.349	4.0
Attestation of Test Results for Simultaneous SAR with Bluetooth			
Frequency Band	Maximum 10g SAR Level(s) Reported(W/kg)		Limit(W/kg)
	Position	Maximum 10g SAR(W/kg)	
RFID(DSB-ASK)	Hand-held SAR	2.386	4.0
RFID(PR-ASK)	Hand-held SAR	2.350	4.0
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 IEC/IEEE 62209-1528 and IEEE 1528-2013 and RF exposure KDB procedures. The results and statements contained in this report pertain only to the device(s) evaluated.			

EUT DESCRIPTION

Technical Specification

Applicant	Technology Solutions (UK) Ltd
Exposure Category	Population / Uncontrolled
Modulation Type	RFID : ASK Bluetooth : GFSK , $\pi/4$ -DQPSK , 8-DPSK BLE(1M) : GFSK
Frequency Band	RFID : 902.75 ~ 927.25 MHz Bluetooth : 2402 ~ 2480 MHz BLE(1M) : 2402 ~ 2480 MHz
RFID Tune-Up Power (dBm)	RFID(DSB-ASK) : 30.00 dBm RFID(PRASK) : 30.00 dBm
RF Tune-Up EIRP Power(dBm)	Bluetooth : GFSK : 4.5 dBm $\pi/4$ -DQPSK : 2.0 dBm 8-DPSK : 2.5 dBm BLE(1M) : 5.5 dBm
Antenna Information	RFID : Antenna Type : QSA Antenna Antenna Gain : 2.5 dBi Bluetooth / BLE(1M) : Antenna Type : Dielectric Chip Antenna Antenna Gain : 2.1 dBi
Power Source	7.2Vdc from Battery
Normal Operation	Hand-held
Sample Received Date	2025/01/06

Note:

1) All measurement and test data in this report was gathered from production sample serial number : RXZ241220075-2 / RXZ241220075-20 (Assigned by BACL, (New Taipei Laboratory)).

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 [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.

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)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

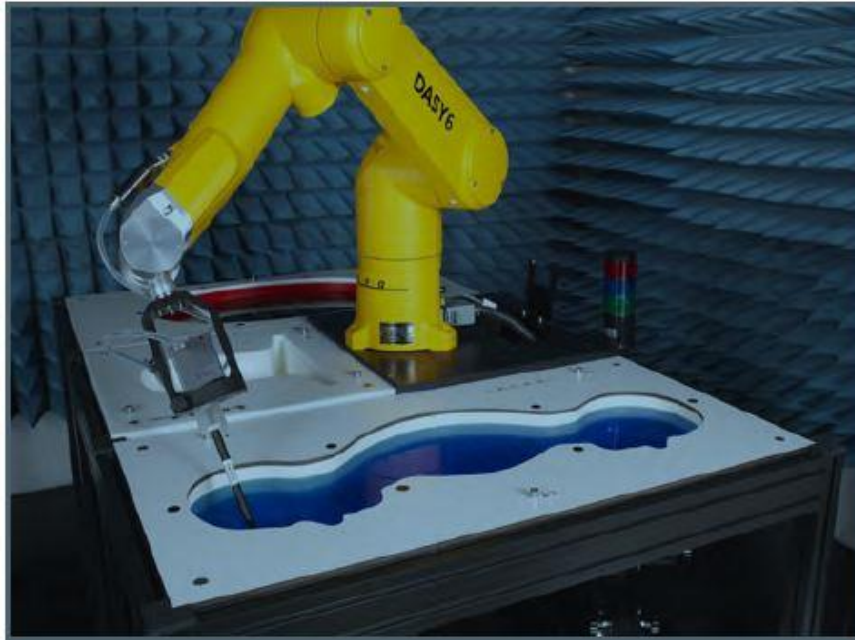
Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

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 10g 4.0W/kg (FCC) applied to the EUT.

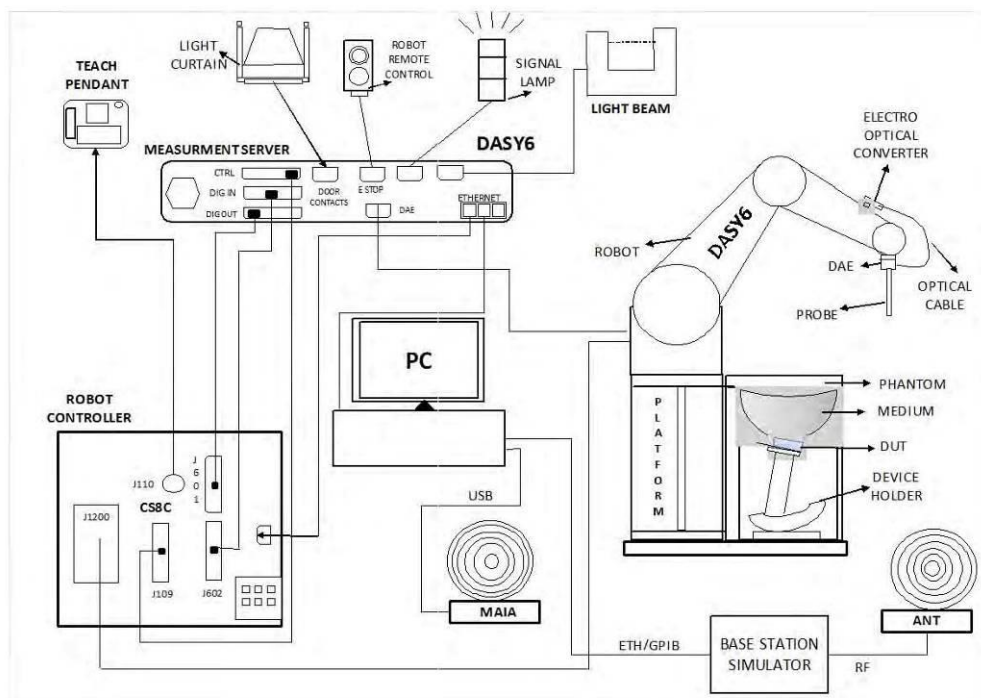
DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY6 from Schmid& Partner Engineering AG (SPEAG) which is the Fifth generation of the system shown in the figure hereinafter:



DASY6 System Description

The DASY6 system for performing compliance tests consists of the following items:



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- A standard high precision 6-axis robot (Staubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal 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.

DASY6 Measurement Server

The DASY6 measurement server is based on a PC/104 CPU board with a 400 MHz Intel ULV Celeron, 128 MB chip-disk and 128 MB 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 DASY6 I/O board, which is directly connected to the PC/104 bus of the CPU board.



The measurement server performs all real-time data evaluations of field measurements and surface detection, controls robot movements, and handles safety operations. 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 pinout, and therefore only devices provided by SPEAG can be connected. Connection of 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	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/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
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%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

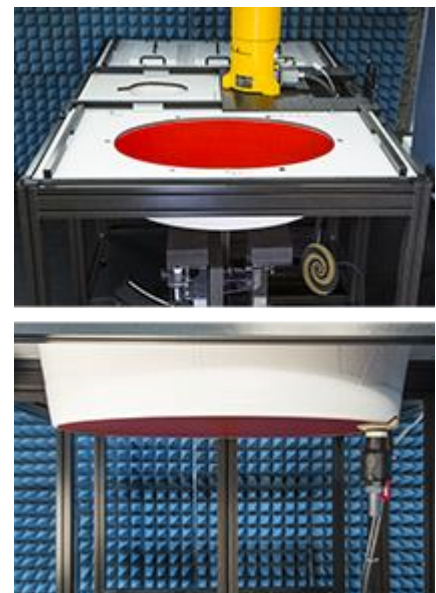
The phantom shell is compatible with SPEAG's tissue simulating liquids (sugar and oil based). Use of other liquids may render the phantom warranty void (see note or consult SPEAG support).

ELI Phantom

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6 GHz. ELI is fully compatible with the latest draft of the standard IEC/IEEE 62209-1528 and the use of all known tissue simulating liquids. ELI has been optimized for performance and can be integrated into a SPEAG standard phantom table. A cover is provided to prevent evaporation of water and changes in liquid parameters. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points.

The phantom shell is compatible with SPEAG's tissue simulating liquids (sugar and oil based). Use of other liquids may render the phantom warranty void (see note or consult SPEAG support).

Approximately 30 liters of liquid is required to fill the ELI phantom.



Robots

The DASY6 system uses the high-precision industrial robots TX60L, TX90XL, and RX160L from StaubliSA (France). The TX robot family - the successor of the well-known RX robot family - continues to offer the features important for DASY6 applications:

- 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 robots are controlled by the Staubli CS8c robot controllers. All information regarding the use and maintenance of the robot arm and the robot controller is provided

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 DASY6 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/m³ 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 5 x 5 x 7 (8mmx8mmx5mm) providing a volume of 30 mm in the X & Y & Z axis.

Recommended Tissue Dielectric Parameters for Head and Body

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEC/IEEE 62209-1528

Recommended Tissue Dielectric Parameters for the tissue-equivalent medium

Table 2 – Dielectric properties of the tissue-equivalent medium

Frequency(MHz)	permittivity,(ϵ'r)	Conductivity, σ(S/m)
4	55,0	0,75
13	55,0	0,75
30	55,0	0,75
150	52,3	0,76
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
1450	40,5	1,20
1800	40,0	1,40
1900	40,0	1,40
1950	40,0	1,40
2000	40,0	1,40
2100	39,8	1,49
2450	39,2	1,80
2600	39,0	1,96
3000	38,5	2,40
3500	37,9	2,91
4000	37,4	3,43
4500	36,8	3,94
5000	36,2	4,45
5200	36,0	4,66
5400	35,8	4,86
5600	35,5	5,07
5800	35,3	5,27
6000	35,1	5,48
6500	34,5	6,07
7000	33,9	6,65

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<i>7500</i>	<i>33,3</i>	<i>7,24</i>
<i>8000</i>	<i>32,7</i>	<i>7,84</i>
<i>8500</i>	<i>32,1</i>	<i>8,46</i>
<i>9000</i>	<i>31,6</i>	<i>9,08</i>
<i>9500</i>	<i>31,0</i>	<i>9,71</i>
<i>10000</i>	<i>30,4</i>	<i>10,40</i>

NOTE For convenience, permittivity and conductivity values are linearly interpolated for frequencies that are not a part of the original data from Drossos et al. [2]. They are shown in italics in Table 2. The italicized values are linearly interpolated (below 5800 MHz) or extrapolated (above 5800 MHz) from the non-italicized values that are immediately above and below these values.

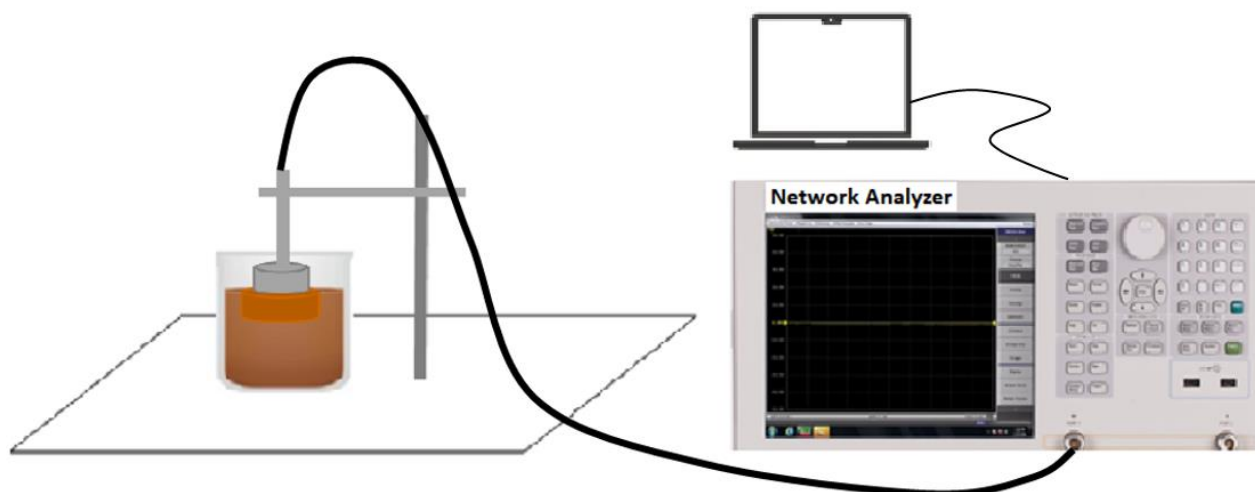
EQUIPMENT LIST AND CALIBRATION

Equipment's List & Calibration Information

Equipment	Model	S/N	Calibration Date	Calibration Due Date
Robot	TX90	5N26A1	N.C.R	N.C.R
DASY5 Test Software	DASY5.2	N/A	N.C.R	N.C.R
DASY6 Measurement Server	DASY 6.0	1588	N/A	N/A
Data Acquisition Electronics	DAE	1561	2024/12/05	2025/12/04
E-Field Probe	EX3DV4	7520	2024/12/16	2025/12/15
Dipole, 835 MHz	D835V2	454	2023/11/21	2026/11/20
Dipole, 2450 MHz	D2450V2	1068	2024/12/05	2025/12/04
Spectrum Analyzer	FSV40	101204	2025/06/04	2026/06/03
Twin ELI	Twin ELI V8.0	2088	N/A	N/A
Simulated Tissue 0.6G~6GHz Head	TS-6GHz-H	N/A	Each Time/	
Mounting Device	N/A	SD 000 H01 KA	N/A	N/A
Network Analyzer	E5063A	MY54402093	2024/12/27	2025/12/26
Dielectric probe kit	85070B	50207	N/A	N/A
MXG Signal Generator	N5183A	MY50140407	2024/12/25	2025/12/24
EPM Series Power Meter	E4419B	GB43312279	2025/01/03	2026/01/02
Avg Power Sensor	E9304A H18	MZ54110016	2025/01/03	2026/01/02
Power Amplifier	ZVE-8G+	365701647	2025/01/08	2026/01/07
Power Amplifier	ZHL-42W+	329401642	2025/01/08	2026/01/07
Temperature and Humidity Recoder	HTC-1	005	2024/10/30	2025/10/29
Directional Coupler	488Z	810	N.C.R	N.C.R
Attenuator	20dB, 100W	1453	N.C.R	N.C.R

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

Tissue fluid temperature : 23.7°C

Test Date	Frequency (MHz)	Liquid Type	Liquid parameter		Target parameter		Delta (%)		Tolerance (%)
			σ' (S/m)	ϵ_r	σ' (S/m)	ϵ_r	σ' (S/m)	ϵ_r	
2025/06/27	835	HSL	0.985	42.633	0.900	41.500	9.44	2.73	± 10
	902.75	HSL	1.016	42.619	0.970	41.500	4.74	2.70	± 10
	915.25	HSL	1.018	42.607	0.980	41.470	3.88	2.74	± 10
	927.25	HSL	1.020	42.521	0.980	41.450	4.08	2.58	± 10

Note : 1) Please refer to page 21 SAR plot.

2) For SAR plot : 1,2,3,4,5,5-1,6,7,7-1,8,8-1,11,12,13,14,15,15-1,16,17,17-1,18,18-1.

Tissue fluid temperature : 23.5°C

Test Date	Frequency (MHz)	Liquid Type	Liquid parameter		Target parameter		Delta (%)		Tolerance (%)
			σ' (S/m)	ϵ_r	σ' (S/m)	ϵ_r	σ' (S/m)	ϵ_r	
2025/09/08	835	HSL	0.937	43.616	0.900	41.500	4.11	5.10	± 10
	902.75	HSL	0.968	43.574	0.970	41.500	-0.21	5.00	± 10
	915.25	HSL	0.970	43.557	0.980	41.470	-1.02	5.03	± 10
	927.25	HSL	0.972	43.484	0.980	41.450	-0.82	4.91	± 10

Note : 1) Please refer to page 22 SAR plot.

2) For SAR plot : 2-1,5-2,5-3,12-1,15-2,15-3.

Tissue fluid temperature : 23.6°C

Test Date	Frequency (MHz)	Liquid Type	Liquid parameter		Target parameter		Delta (%)		Tolerance (%)
			σ' (S/m)	ϵ_r	σ' (S/m)	ϵ_r	σ' (S/m)	ϵ_r	
2025//09/09	2450	HSL	1.867	42.182	1.80	39.20	3.72	7.61	±10
	2402	HSL	1.822	42.228	1.76	39.270	3.52	7.53	±10
	2440	HSL	1.859	42.179	1.79	39.220	3.85	7.55	±10
	2441	HSL	1.86	42.180	1.79	39.220	3.91	7.55	±10
	2480	HSL	1.888	42.129	1.82	39.180	3.74	7.53	±10

Note : 1) Please refer to page 23 SAR plot.

2) For SAR plot : 21~26,26-1~26-3 and 31~36,36-1~36-3.

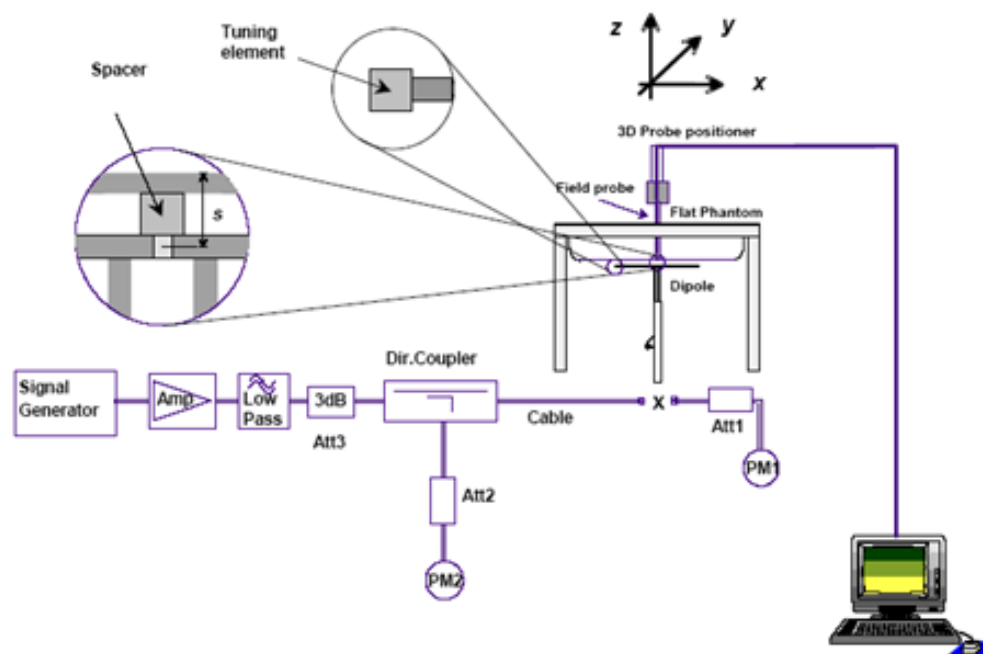
System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of $\pm 10\%$. 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) $s = 15 \text{ mm} \pm 0,2 \text{ mm}$ for $300 \text{ MHz} \leq f \leq 1\,000 \text{ MHz}$;
- b) $s = 10 \text{ mm} \pm 0,2 \text{ mm}$ for $1\,000 \text{ MHz} < f \leq 3\,000 \text{ MHz}$;
- c) $s = 10 \text{ mm} \pm 0,2 \text{ mm}$ for $3\,000 \text{ MHz} < f \leq 6\,000 \text{ MHz}$.

System Verification Setup Block Diagram



System Accuracy Check Results

System Check for 10g SAR

Test Date	Frequency Band (MHz)	Input Power (mW)	Measured SAR (W/kg)	Target Value (W/kg)	Normalized to 1W (W/kg)	Deviation (%)	Tolerance (%)
2025/06/27	835	250	1.62	6.26	6.48	3.51	±10
2025/09/08	835	250	1.59	6.26	6.36	1.60	±10
2025/09/09	2450	100	2.45	23.7	24.5	3.38	±10

Note:

- 1) For the power inputted to dipole is 0.25Watt; the SAR values are normalized to 1 Watt forward power by multiplying 4 times.
- 2) For the power inputted to dipole is 0.10Watt; the SAR values are normalized to 1 Watt forward power by multiplying 10 times.

SAR SYSTEM VALIDATION DATA

Test Laboratory: BACL SAR Testing Lab

Date: 06/27/2025

System Check_835MHz_D835V2

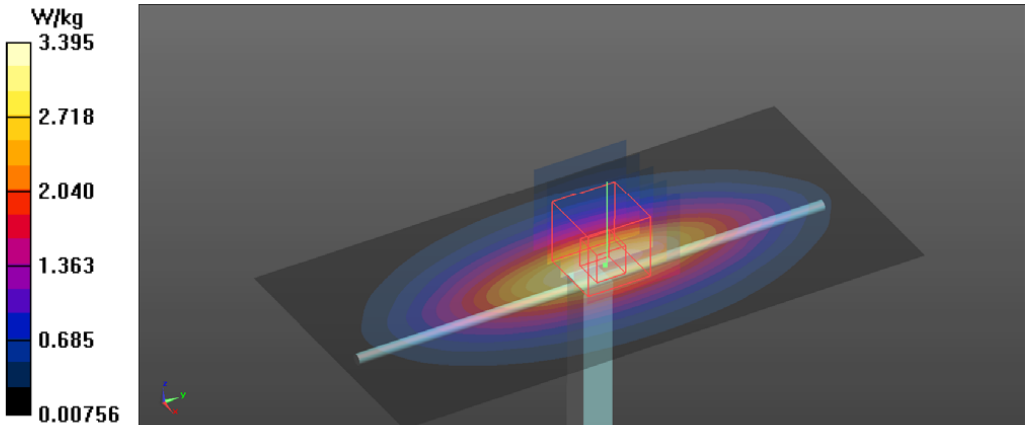
DUT: Dipole 835 MHz

Communication System: UID 0, CW (0); Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL 835 Medium parameters used: $f = 835\text{ MHz}$; $\sigma = 0.985\text{ S/m}$; $\epsilon_r = 42.633$; $\rho = 1000\text{ kg/m}^3$

- DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(9.25, 8.81, 8.84) @ 835 MHz; Calibrated: 12/16/2024
 - Sensor-Surface: 1.4mm (Mechanical Surface Detection)
 - Electronics: DAE4 Sn1561; Calibrated: 12/5/2024
 - Phantom: ELI-Righr-ELI V8.0 (20deg probe tilt); Type: QD OVA 004 Ax; Serial: 2088
 - Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (61x121x1): Interpolated grid: $dx=1.500\text{ mm}$, $dy=1.500\text{ mm}$
Maximum value of SAR (interpolated) = 3.40 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 62.96 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 3.75 W/kg
SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.62 W/kg
Smallest distance from peaks to all points 3 dB below = 16 mm
Ratio of SAR at M2 to SAR at M1 = 66.3%
Maximum value of SAR (measured) = 3.36 W/kg



Test Laboratory: BACL SAR Testing Lab

Date: 09/08/2025

System Check_835MHz_D835V2

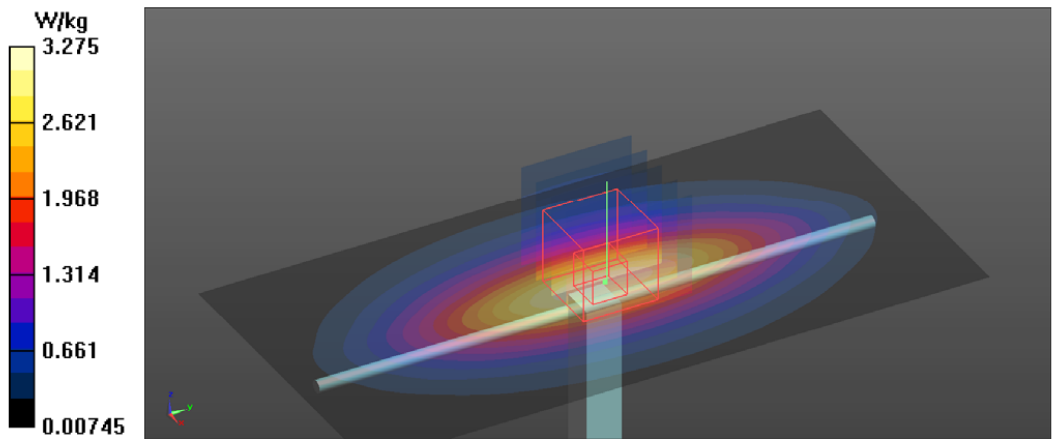
DUT: Dipole 835 MHz

Communication System: UID 0, CW (0); Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL 835 Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.937 \text{ S/m}$; $\epsilon_r = 43.616$; $\rho = 1000 \text{ kg/m}^3$

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(9.25, 8.81, 8.84) @ 835 MHz; Calibrated: 12/16/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 12/5/2024
- Phantom: ELI-Righr-ELI V8.0 (20deg probe tilt); Type: QD OVA 004 Ax; Serial: 2088
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (61x121x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$
Maximum value of SAR (interpolated) = 3.27 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 63.46 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 3.67 W/kg
SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.59 W/kg
Smallest distance from peaks to all points 3 dB below = 16.7 mm
Ratio of SAR at M2 to SAR at M1 = 66.2%
Maximum value of SAR (measured) = 3.26 W/kg



Test Laboratory: BACL SAR Testing Lab

Date: 09/09/2025

System Check_2450MHz_D2450V2

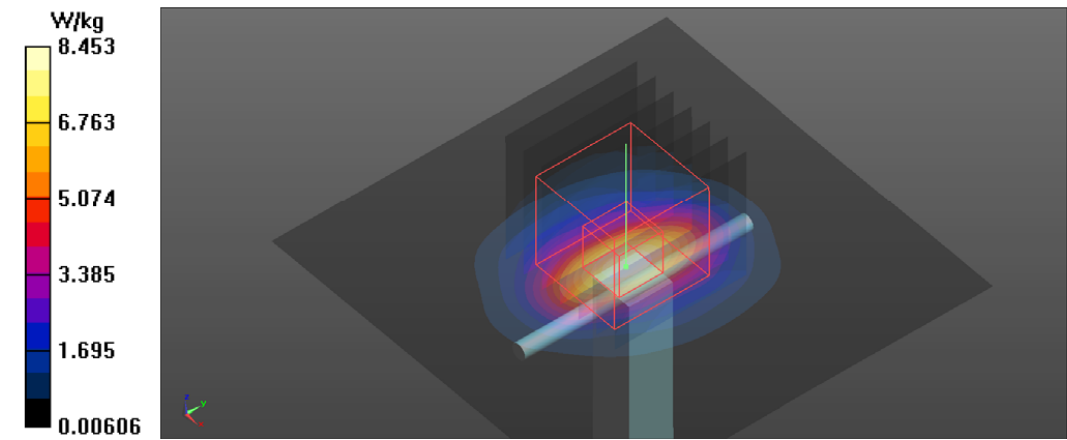
DUT: D2450V2 - SN1068

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL 2450 Medium parameters used: $f = 2450\text{ MHz}$; $\sigma = 1.867\text{ S/m}$; $\epsilon_r = 42.182$; $\rho = 1000\text{ kg/m}^3$

- DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(7.24, 6.9, 6.92) @ 2450 MHz; Calibrated: 12/16/2024
 - Sensor-Surface: 1.4mm (Mechanical Surface Detection)
 - Electronics: DAE4 Sn1561; Calibrated: 12/5/2024
 - Phantom: ELI-Righr-ELI V8.0 (20deg probe tilt); Type: QD OVA 004 Ax; Serial: 2088
 - Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=100mW/Area Scan (61x61x1): Interpolated grid: $dx=1.500\text{ mm}$, $dy=1.500\text{ mm}$
Maximum value of SAR (interpolated) = 8.45 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{ mm}$, $dy=5\text{ mm}$, $dz=5\text{ mm}$
Reference Value = 71.74 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 10.3 W/kg
SAR(1 g) = 5.19 W/kg; SAR(10 g) = 2.45 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 50.8%
Maximum value of SAR (measured) = 8.51 W/kg



EUT TEST STRATEGY AND METHODOLOGY

Test positions for Hand-held and other configurations

Hand-held SAR testing is according EN IEC/IEEE 62209-1528 7.2.4.1.10), When SAR measurement is necessary for hand-held devices that do not transmit while at the head or torso, a flat phantom may be used.

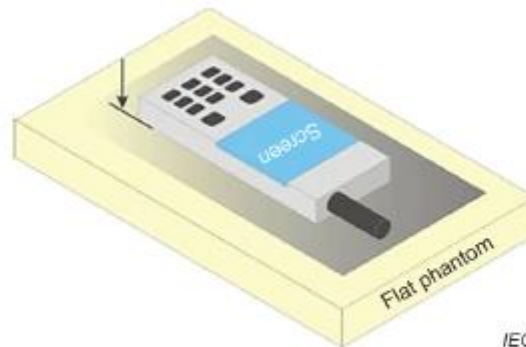


Figure 11 – Test position for hand-held devices, not used at the head or torso

Test Distance for SAR Evaluation

Default separation distance: To assess this type of device, the device shall be placed directly against the flat phantom as shown in Figure 11, for the sides of the device that are in contact with the hand for the intended use.

IF when there is neither a regulatory requirement nor an intended use distance specified by the manufacturer, the DUT shall be measured with each accessible face in direct contact with the surface of the phantom. SAR testing photo please refer to “APPENDIX B EUT TEST POSITION PHOTOS”.

SAR Evaluation Procedure :

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the 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 local SAR at a test point at 1.4mm of the inner surface of the phantom recommended by SPEAG. The area covered the entire dimension of the radiating structures of the EUT, the horizontal grid spacing was 15mm x 15mm, 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 32mm x 32mm x 30mm was assessed by measuring 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

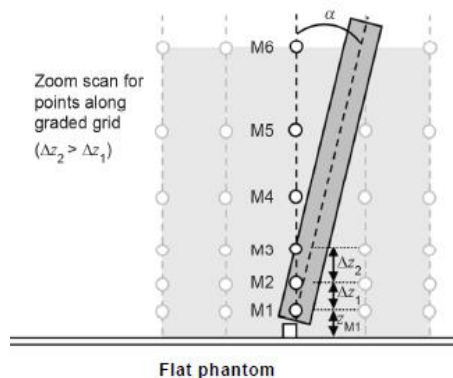
1) The data at the surface were extrapolated, since the center of the dipoles is 1.0 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.4 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated 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.

During SAR testing, Area scan and Zoom scan test is according IEC/EEE 62209-1528 7.4.2 d) 2)



CONDUCTED OUTPUT POWER MEASUREMENT

The measured peak output power should be greater and within 5% than EMI measurement.

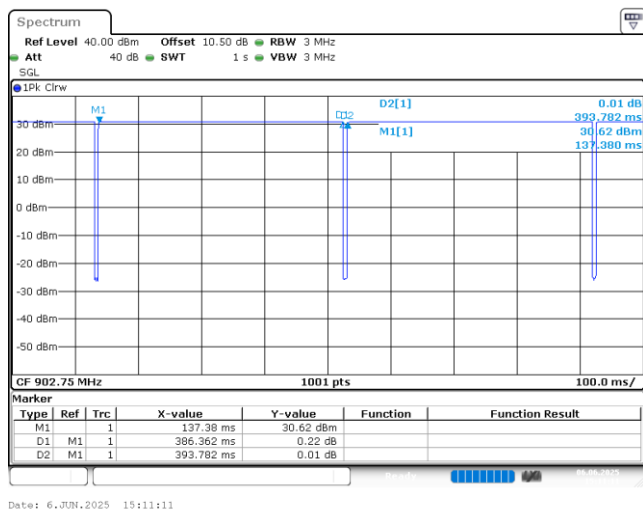
The RF output power testing please refer to RF test report no: RXZ241220075RF07/08/09.

Channel List :

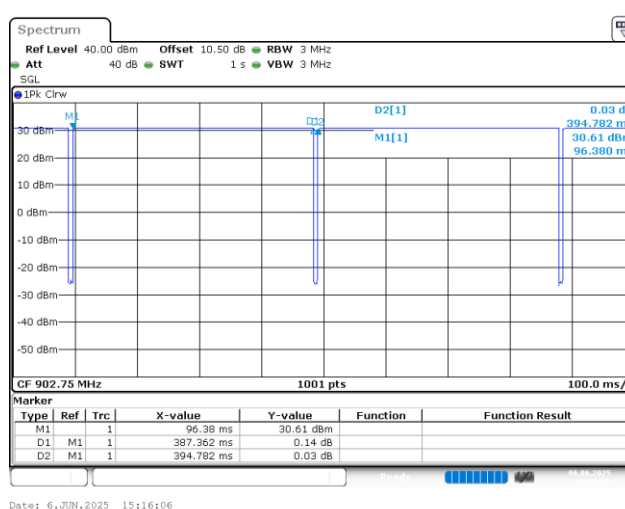
RFID:

Modulation	Channel	Frequency(MHz)
DSB-ASK	1	902.75
	2	915.25
	3	927.25
PR-ASK	1	902.75
	2	915.25
	3	927.25

RFID(DSB-ASK) :



RFID(PR-ASK) :



Duty Cycle:

According EN IEC/IEEE 62209-1528 section 7.6.6 c) The radio communication test set shall be set to request maximum TX power and duty factor from the DUT according to wireless technology requirements.

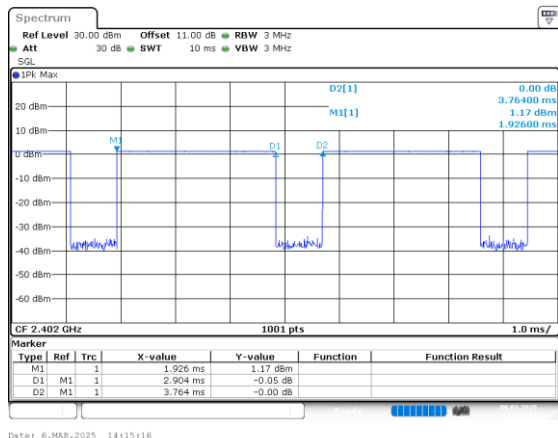
RFID	DSB-ASK	PR-ASK
Duty Cycle(%)	98.116%	98.120%
Duty Factor	0.083	0.082

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

RFID Conducted Power & Tune-Up Power Table :

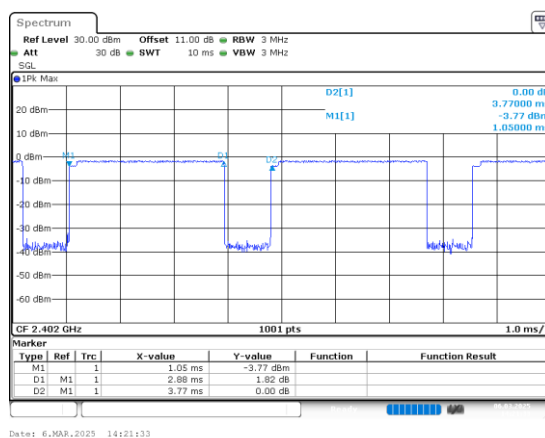
Modulation	Channel	Freq.(MHz)	Conducted Power Peak(dBm)	Tune-Up Power (dBm)
DSB-ASK	1	902.75	29.88	30.00
	2	915.25	29.93	30.00
	3	927.25	29.83	30.00
PR-ASK	1	902.75	29.91	30.00
	2	915.25	29.97	30.00
	3	927.25	29.89	30.00

Bluetooth_1M :



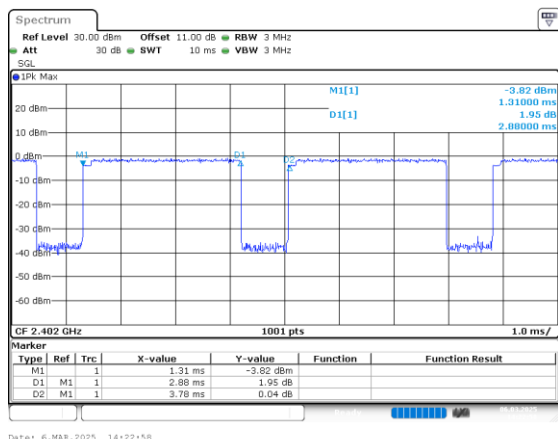
Date: 6.MAR.2025 14:15:16

Bluetooth_2M :



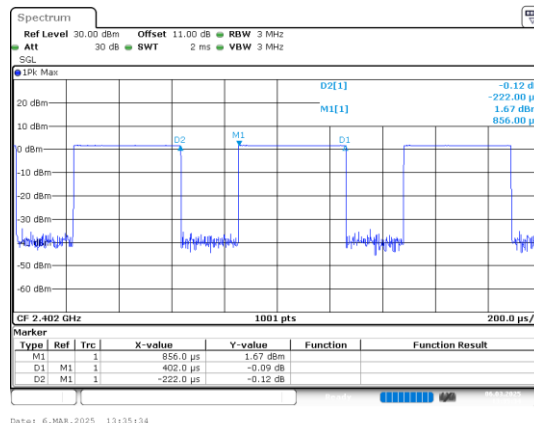
Date: 6.MAR.2025 14:21:33

Bluetooth_3M :



Date: 6.MAR.2025 14:22:58

BLE :



Date: 6.MAR.2025 13:35:34

Bluetooth	1M	2M	3M
Duty Cycle(%)	77.15%	76.39%	76.19%
Duty Factor	1.127	1.169	1.181
BLE	1M		
Duty Cycle(%)	64.42%		
Duty Factor	1.910		

Bluetooth Channel Frequency List :

Mode	Channel	Frequency(MHz)	Mode	Channel	Frequency(MHz)
GFSK	0	2402	$\pi/4$ -DQPSK	0	2402
	39	2441		39	2441
	78	2480		78	2480
8-DPSK	0	2402	BLE	0	2402
	39	2441		19	2440
	78	2480		39	2480

Bluetooth EIRP Power Table :

Modulation	Channel	Freq. (MHz)	Conducted Power (dBm)	Antenna Gain(dBi)	EIRP Power (dBm)	Tune-Up EIRP Power (dBm)
GFSK	0	2402	0.79	2.1	2.89	4.50
	39	2441	1.46	2.1	3.56	4.50
	78	2480	2.12	2.1	4.22	4.50
$\pi/4$ -DQPSK	0	2402	-1.82	2.1	0.28	2.00
	39	2441	-1.17	2.1	0.93	2.00
	78	2480	-0.48	2.1	1.62	2.00
8-DPSK	0	2402	-1.31	2.1	0.79	2.50
	39	2441	-0.71	2.1	1.39	2.50
	78	2480	0.02	2.1	2.12	2.50

BLE EIRP Power Table :

Modulation	Channel	Freq.(MHz)	Conducted Power (dBm)	Antenna Gain(dBi)	EIRP Power (dBm)	Tune-Up EIRP Power (dBm)
BLE	0	2402	1.68	2.1	3.78	5.50
	19	2440	2.22	2.1	4.32	5.50
	39	2480	2.99	2.1	5.09	5.50

Note : According KDB447498 D04 Table B.2, BLE SAR exemption power is 4.77 dBm for 2402MHz and 4.77 dBm for 2440MHz and 4.73 dBm for 2480MHz. Thus BLE SAR testing is required.

STANDALONE SAR TEST EXCLUSION CONSIDERATIONS

Antennas Location for EUT:



Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)



Figure 1: Measurements requested by Bay Area Compliance Laboratories Corp

SAR testing configuration :

This product is a handheld UHF RFID reader (operating at 902.75 to 927.75MHz). It has a special port on the top that requires a dedicated control device. The device also has a Bluetooth and BLE module and antenna underneath, allowing for simultaneous transmission of RFID and Bluetooth or BLE signals.

Testing the DUT without(wo) 2D imager using the maximum conducted power channel to test at all positions, and then testing the DUT with(w) 2D imager at the worst position.

DUT with (w) 2D imager	DUT without(wo) 2D imager
	

1. The EUT was set directly against the test phantom during SAR scan for Top/BottomR/Bottom/Left/Righ/Front/Back.

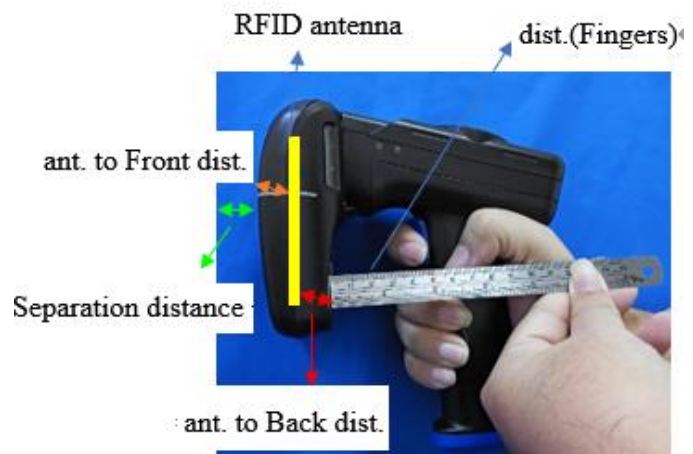
The back of the RFID antenna presents difficulties in SAR testing, so another method was used to meet testing requirements.

2. For Back side(RFID antenna Back, faces the Fingers), the Front side SAR data is begin used in conjunction with the directivity measurements as a substitute for the back side data(since it will be more conservative). The test distance used for the front side SAR test should be the same distance from back side of the antenna to the fingers during normal operation. Thus :

$$\text{Separation distance} + (\text{ant. to Front dist.}) = (\text{ant. to Back dist.}) + \text{dist.}(\text{Fingers})$$

The back of the RFID antenna presents difficulties in SAR testing, so another method was used to meet testing requirements.

According to the figure below, human fingers vary in thickness. The distance from the finger to the back of the RFID antenna is 25mm.



ant. to Front dist. = 11.9mm

ant. to Back dist. = 19.9mm

dist.(Fingers) = 25mm

$$\text{Separation distance} = 19.9\text{mm} + 25\text{mm} - 11.9\text{mm} = 33\text{mm}$$

For sufficiently consideration, a test separation distance of 30mm from the front surface to the flat phantom was used for SAR measurement.

SAR test plot and result please refer to plot 5-2, 5-3, 15-2, 15-3.

dist.(mm)	Top	Bottom	BottomR	Left	Right	Back	Back	Front
RFID ant.	30.4	16.6	82.6	13.8	13.8	19.9	19.9	11.9
BLE/BT ant.	13.2	103.4	143.4	45.1	45.1	8.6	8.6	145.1

Dist. for RFID antenna to edge :

Supporting Evidence - Measurements taken from CAD 3D model



Figure 3: Distance to radiating surface from 'Top side' of 3138 Reader

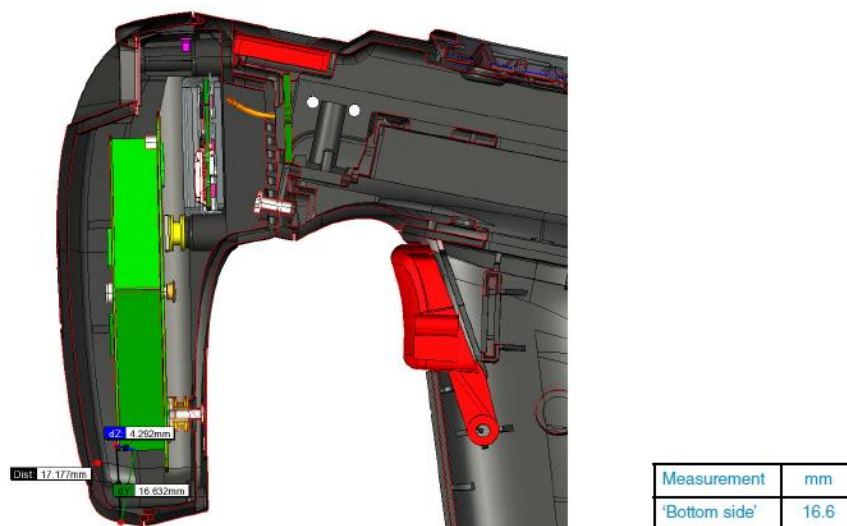


Figure 4: Distance to radiating surface from 'Bottom side' of 3138 Reader

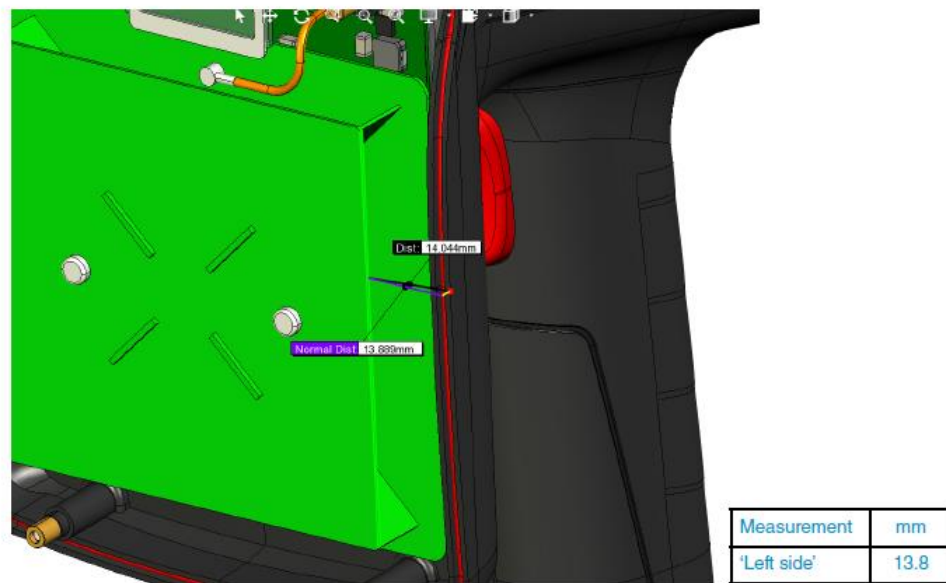


Figure 5: Distance to radiating surface from 'Left side' of 3138 Reader



Figure 6: Distance to radiating surface from 'Right side' of 3138 Reader



Figure 7: Distance to radiating surface from 'Front side' of 3138 Reader



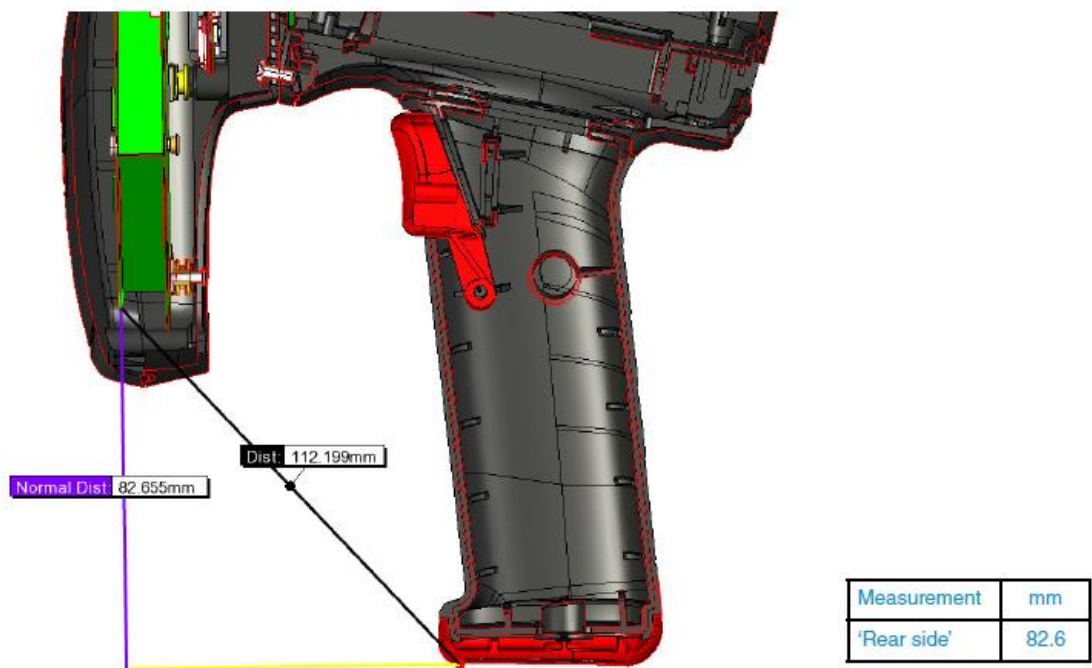


Figure 9: Distance to radiating surface from 'Rear side' of 3138 Reader

Dist. for BT/BLE antenna to edge :

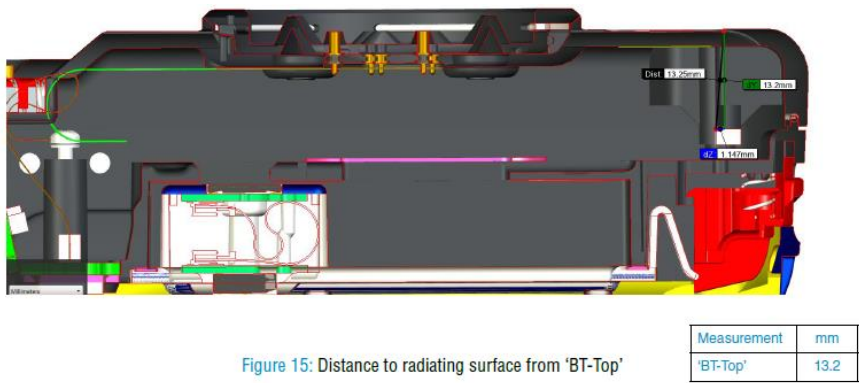
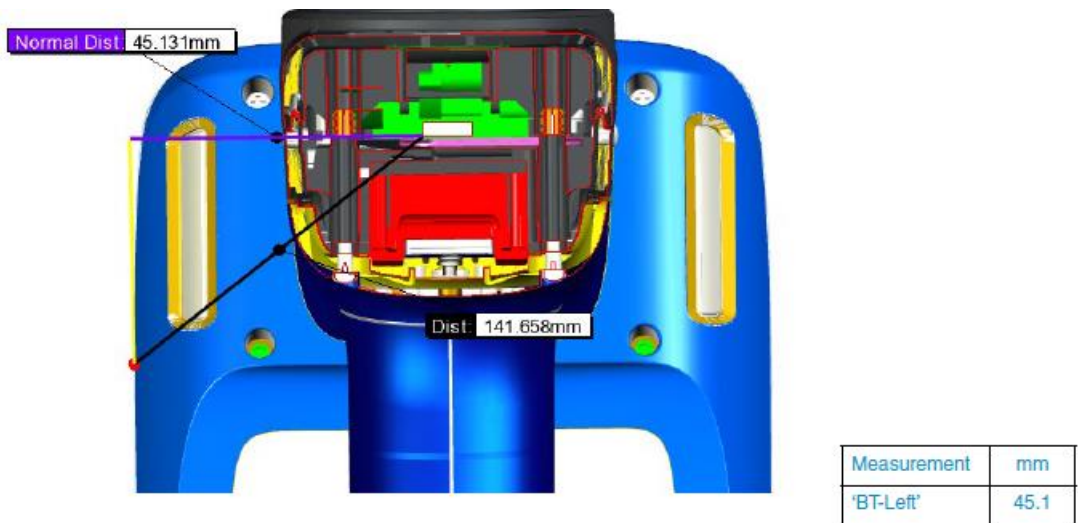
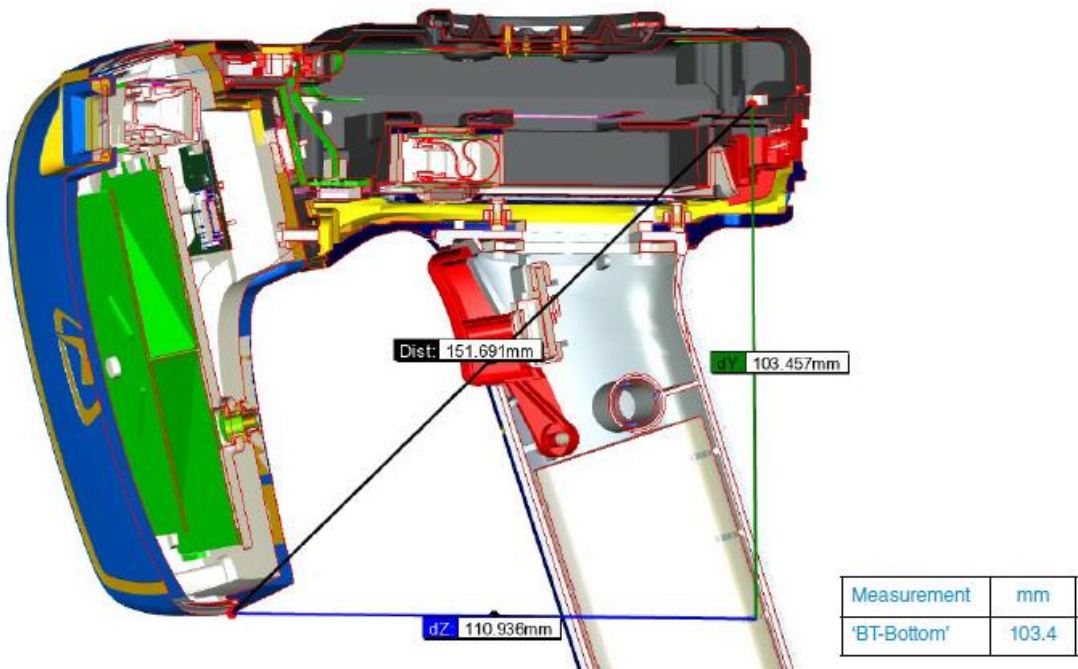


Figure 15: Distance to radiating surface from 'BT-Top'



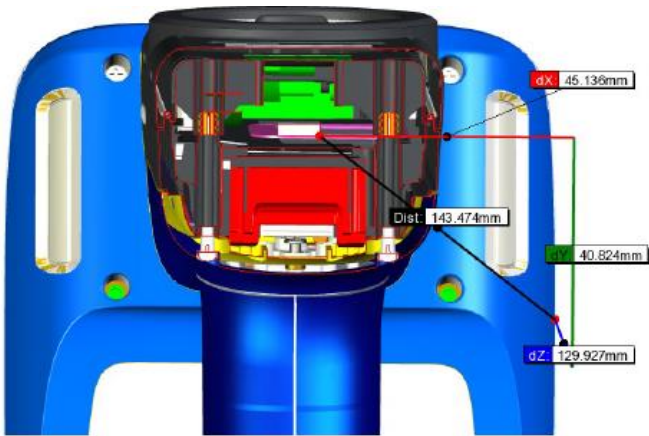
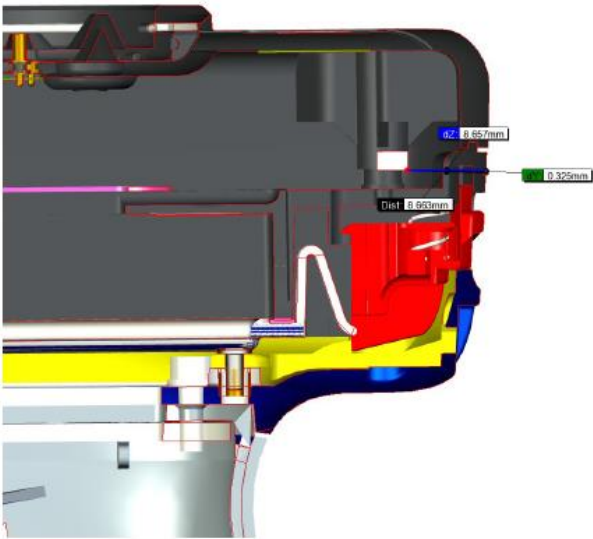


Figure 19: Distance to radiating surface from 'BT-Right'

Measurement	mm
'BT-Right'	45.1



Measurement	mm
'BT-Front'	145.1



Measurement	mm
'BT-Back'	8.6

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed diametric evaluation.

For SAR testing of RFID signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to “1/(duty cycle)”.

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

For RFID, Reported SAR(W/kg) = Measured SAR(W/kg) * Duty Cycle scaling factor * Scaling factor.

SAR Test Data

Environmental Conditions

Test Date	2025/06/27	2025/09/08	2025/09/09
Freq. Band(MHz)	835MHz	835MHz	2450MHz
Temperature	23.8 °C	23.9 °C	23.7 °C
Relative Humidity	54 %	55 %	56 %
Test Engineer	Sean Chen	Sean Chen	Sean Chen

RFID(DSB-ASK) :

EUT Position	Freq. (MHz)	Test Mode	Maximum Measured Power (dBm)	Maximum Rated Power (dBm)	Scaled Factor	10g SAR (W/Kg)					
						Duty Cycle(%)	Duty Factor	Measured SAR	Scaled SAR	Limit	Plot
Top side	915.25	RFID	29.93	30.00	1.016	98.12%	0.083	0.047	0.049	4.0	1
BottomR side	915.25	RFID	29.93	30.00	1.016	98.12%	0.083	0.078	0.081	4.0	2
Bottom side	915.25	RFID	29.93	30.00	1.016	98.12%	0.083	0.996	1.031	4.0	2-1
Left side	915.25	RFID	29.93	30.00	1.016	98.12%	0.083	0.630	0.652	4.0	3
Right side	915.25	RFID	29.93	30.00	1.016	98.12%	0.083	0.496	0.514	4.0	4
Front side	915.25	RFID	29.93	30.00	1.016	98.12%	0.083	1.700	1.760	4.0	5
Front side	915.25	RFID	29.93	30.00	1.016	98.12%	0.083	1.080	1.118	4.0	5-1
Back side	915.25	RFID	29.93	30.00	1.016	98.12%	0.083	0.857	0.887	4.0	5-2
Back side	915.25	RFID	29.93	30.00	1.016	98.12%	0.083	0.795	0.823	4.0	5-3
Back side	915.25	RFID	29.93	30.00	1.016	98.12%	0.083	0.024	0.025	4.0	6
Front side	902.75	RFID	29.88	30.00	1.028	98.12%	0.083	2.330	2.441	4.0	7
Front side	902.75	RFID	29.88	30.00	1.028	98.12%	0.083	2.250	2.357	4.0	7-1
Front side	927.25	RFID	29.83	30.00	1.040	98.12%	0.083	1.310	1.389	4.0	8
Front side	927.25	RFID	29.83	30.00	1.040	98.12%	0.083	0.848	0.899	4.0	8-1

Note: 1) Maximum Measured Power is using Maximum Rated Power.

2) Plot 1, 2, 2-1, 3, 4, 5, 5-2, 6, 7, 8 SAR testing the EUT wo 2D imager.

3) Plot 5-1, 5-3, 7-1, 8-1 SAR testing the EUT w 2D imager.

4) Only plots 5-2 and 5-3 were tested for SAR, with a separation distance of 30mm.

RFID(PR-ASK) :

EUT Position	Freq. (MHz)	Test Mode	Maximum Measured Power (dBm)	Maximum Rated Power (dBm)	Scaled Factor	10g SAR (W/Kg)					
						Duty Cycle(%)	Duty Factor	Measured SAR	Scaled SAR	Limit	Plot
Top side	915.25	RFID	29.97	30.00	1.007	98.12%	0.082	0.063	0.065	4.0	11
BottomR side	915.25	RFID	29.97	30.00	1.007	98.12%	0.082	0.102	0.105	4.0	12
Bottom side	915.25	RFID	29.97	30.00	1.007	98.12%	0.082	0.843	0.865	4.0	12-1
Left side	915.25	RFID	29.97	30.00	1.007	98.12%	0.082	0.827	0.849	4.0	13
Right side	915.25	RFID	29.97	30.00	1.007	98.12%	0.082	0.644	0.661	4.0	14
Front side	915.25	RFID	29.97	30.00	1.007	98.12%	0.082	1.710	1.755	4.0	15
Front side	915.25	RFID	29.97	30.00	1.007	98.12%	0.082	1.420	1.457	4.0	15-1
Back side	915.25	RFID	29.97	30.00	1.007	98.12%	0.082	0.840	0.862	4.0	15-2
Back side	915.25	RFID	29.97	30.00	1.007	98.12%	0.082	0.612	0.628	4.0	15-3
Back side	915.25	RFID	29.97	30.00	1.007	98.12%	0.082	0.033	0.034	4.0	16
Front side	902.75	RFID	29.91	30.00	1.021	98.12%	0.082	2.310	2.404	4.0	17
Front side	902.75	RFID	29.91	30.00	1.021	98.12%	0.082	2.250	2.341	4.0	17-1
Front side	927.25	RFID	29.89	30.00	1.026	98.12%	0.082	1.330	1.391	4.0	18
Front side	927.25	RFID	29.89	30.00	1.026	98.12%	0.082	1.300	1.359	4.0	18-1

Note: 1) Maximum Measured Power is using Maximum Rated Power.

2) Plot 11, 12, 12-1, 13, 14, 15, 15-2, 16, 17,18 SAR testing the EUT wo 2D imager.

3) Plot 15-1, 15-3, 17-1, 18-1 SAR testing the EUT w 2D imager.

4) Only plots 15-2 and 15-3 were tested for SAR, with a separation distance of 30mm.

BLE / Bluetooth :

EUT Position	Freq. (MHz)	Test Mode	Maximum Measured Power (dBm)	Maximum Rated Power (dBm)	Scaled Factor	10g SAR (W/Kg)					
						Duty Cycle(%)	Duty Factor	Measured SAR	Scaled SAR	Limit	Plot
Top side	2480	BLE1M	5.09	5.50	1.099	64.42%	1.910	<0.001	<0.001	4.0	21
BottomR side	2480	BLE1M	5.09	5.50	1.099	64.42%	1.910	<0.001	<0.001	4.0	22
Left side	2480	BLE1M	5.09	5.50	1.099	64.42%	1.910	<0.001	<0.001	4.0	23
Right side	2480	BLE1M	5.09	5.50	1.099	64.42%	1.910	<0.001	<0.001	4.0	24
Front side	2480	BLE1M	5.09	5.50	1.099	64.42%	1.910	<0.001	<0.001	4.0	25
Back side	2480	BLE1M	5.09	5.50	1.099	64.42%	1.910	0.001	0.002	4.0	26
Back side	2402	BLE1M	3.78	5.50	1.486	64.42%	1.910	<0.001	<0.001	4.0	26-1
Back side	2440	BLE1M	4.32	5.50	1.312	64.42%	1.910	<0.001	<0.001	4.0	26-2
Back side	2480	BLE1M	5.09	5.50	1.099	64.42%	1.910	0.001	0.002	4.0	26-3
Top side	2480	BT1M	4.22	4.50	1.067	77.15%	1.127	<0.001	<0.001	4.0	31
BottomR side	2480	BT1M	4.22	4.50	1.067	77.15%	1.127	<0.001	<0.001	4.0	32
Left side	2480	BT1M	4.22	4.50	1.067	77.15%	1.127	<0.001	<0.001	4.0	33
Right side	2480	BT1M	4.22	4.50	1.067	77.15%	1.127	<0.001	<0.001	4.0	34
Front side	2480	BT1M	4.22	4.50	1.067	77.15%	1.127	<0.001	<0.001	4.0	35
Back side	2480	BT1M	4.22	4.50	1.067	77.15%	1.127	0.002	0.003	4.0	36
Back side	2402	BT1M	2.89	4.50	1.449	77.15%	1.127	<0.001	<0.001	4.0	36-1
Back side	2441	BT1M	3.56	4.50	1.242	77.15%	1.127	<0.001	<0.001	4.0	36-2
Back side	2480	BT1M	4.22	4.50	1.067	77.15%	1.127	0.002	0.003	4.0	36-3

Note: 1) Maximum Measured Power is using Maximum Rated Power.

2) Plot 21, 22, 23, 24, 25, 26, 26-1, 26-2 and 31, 32, 33, 34, 35, 36, 36-1, 36-2 SAR testing the EUT w 2D imager.

3) Plot 26-3 and 36-3 SAR testing the EUT w 2D imager.

SAR correction for deviations of complex permittivity from targets

In this standard, dielectric parameters of the tissue-equivalent liquid used for SAR measurement are chosen so as to give an SAR value that is conservative with respect to the exposure in a person. Deviations of the dielectric parameters from the target values can lead to measurement uncertainty. One way to reduce measurement uncertainty is to keep the dielectric parameters of the tissue-equivalent liquids within a tight tolerance of the targets (e.g., within $\pm 5\%$). However, it can be difficult to find suitable and stable liquid recipes whose dielectric parameters are close to the targets, particularly at frequencies above 2 GHz. There are three solutions to this problem:

- change the target dielectric parameters to match those of available liquid recipes;
- widen the tolerance (without correcting the SAR for the deviation in dielectric parameters);
- allow a wider tolerance, and correct the SAR for the deviation of the measured dielectric parameters from the target values.

The third solution is the best because changing the targets may restrict the standard to particular liquid recipes, and simply widening the tolerance increases the measurement uncertainty.

$$\Delta \text{SAR} = c_{\epsilon} \Delta \epsilon_r + c_{\sigma} \Delta \sigma \quad (\text{F.1})$$

$$c_{\epsilon} = -7,854 \times 10^{-4} f^3 + 9,402 \times 10^{-3} f^2 - 2,742 \times 10^{-2} f - 0,2026 \quad (\text{F.2})$$

$$c_{\sigma} = 9,804 \times 10^{-3} f^3 - 8,661 \times 10^{-2} f^2 + 2,981 \times 10^{-2} f + 0,7829 \quad (\text{F.3})$$

$$c_{\epsilon} = 3,456 \times 10^{-3} f^3 - 3,531 \times 10^{-2} f^2 + 7,675 \times 10^{-2} f - 0,1860 \quad (\text{F.4})$$

$$c_{\sigma} = 4,479 \times 10^{-3} f^3 - 1,586 \times 10^{-2} f^2 - 0,1972 f + 0,7717 \quad (\text{F.5})$$

SAR Plot	Freq. (MHz)	δ	ϵ_r	Target δ	Target ϵ_r	$\Delta\delta$ %	$\Delta\epsilon_r$ %	C_{ϵ} 10g	C_{δ} 10g	ΔSAR 10g	Scaling SAR 10g	Corr. SAR 10g
1	915.25	1.018	42.607	0.980	41.470	3.88	2.74	-0.143	0.581	1.862	0.049	0.048
2	915.25	1.018	42.607	0.980	41.470	3.88	2.74	-0.143	0.581	1.862	0.081	0.079
2-1	915.25	1.018	42.607	0.980	41.470	3.88	2.74	-0.143	0.581	1.862	1.031	1.012
3	915.25	1.018	42.607	0.980	41.470	3.88	2.74	-0.143	0.581	1.862	0.652	0.640
4	915.25	1.018	42.607	0.980	41.470	3.88	2.74	-0.143	0.581	1.862	0.514	0.504
5	915.25	1.018	42.607	0.980	41.470	3.88	2.74	-0.143	0.581	1.862	1.760	1.727
5-1	915.25	1.018	42.607	0.980	41.470	3.88	2.74	-0.143	0.581	1.862	1.118	1.097
5-2	915.25	1.018	42.607	0.980	41.470	3.88	2.74	-0.143	0.581	1.862	0.887	0.870
5-3	915.25	1.018	42.607	0.980	41.470	3.88	2.74	-0.143	0.581	1.862	0.823	0.808
6	915.25	1.018	42.607	0.980	41.470	3.88	2.74	-0.143	0.581	1.862	0.025	0.025

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

SAR Plot	Freq. (MHz)	δ	ϵ_r	Target δ	Target ϵ_r	$\Delta\delta$ %	$\Delta\epsilon_r$ %	C ϵ 10g	C δ 10g	Δ SAR 10g	Scaling SAR 10g	Corr. SAR 10g
7	902.75	1.016	42.619	0.970	41.500	4.74	2.7	-0.143	0.584	2.38206	2.441	2.383
7-1	902.75	1.016	42.619	0.970	41.500	4.74	2.7	-0.143	0.584	2.38206	2.357	2.301
8	927.25	1.020	42.521	0.980	41.450	4.08	2.58	-0.142	0.579	1.99596	1.389	1.361
8-1	927.25	1.020	42.521	0.980	41.450	4.08	2.58	-0.142	0.579	1.99596	0.899	0.881
11	915.25	1.018	42.607	0.98	41.47	3.88	2.74	-0.143	0.581	1.86246	0.065	0.064
12	915.25	1.018	42.607	0.98	41.47	3.88	2.74	-0.143	0.581	1.86246	0.105	0.103
12-1	915.25	1.018	42.607	0.98	41.47	3.88	2.74	-0.143	0.581	1.862	0.865	0.849
13	915.25	1.018	42.607	0.98	41.47	3.88	2.74	-0.143	0.581	1.86246	0.849	0.833
14	915.25	1.018	42.607	0.98	41.47	3.88	2.74	-0.143	0.581	1.86246	0.661	0.649
15	915.25	1.018	42.607	0.98	41.47	3.88	2.74	-0.143	0.581	1.86246	1.755	1.722
15-1	915.25	1.018	42.607	0.98	41.47	3.88	2.74	-0.143	0.581	1.86246	1.457	1.430
15-2	915.25	1.018	42.607	0.98	41.47	3.88	2.74	-0.143	0.581	1.862	0.862	0.846
15-3	915.25	1.018	42.607	0.98	41.47	3.88	2.74	-0.143	0.581	1.862	0.628	0.616
16	915.25	1.018	42.607	0.98	41.47	3.88	2.74	-0.143	0.581	1.86246	0.034	0.033
17	902.75	1.016	42.619	0.97	41.5	4.74	2.7	-0.143	0.584	2.38206	2.404	2.347
17-1	902.75	1.016	42.619	0.97	41.5	4.74	2.7	-0.143	0.584	2.38206	2.341	2.285
18	927.25	1.02	42.521	0.98	41.45	4.08	2.58	-0.142	0.579	1.99596	1.391	1.363
18-1	927.25	1.02	42.521	0.98	41.45	4.08	2.58	-0.142	0.579	1.99596	1.359	1.332
21	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	<0.001	<0.001
22	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	<0.001	<0.001
23	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	<0.001	<0.001
24	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	<0.001	<0.001
25	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	<0.001	<0.001
26	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	0.002	0.002
26-1	2402	1.822	42.228	1.76	39.270	3.52	7.53	-0.157	0.269	-0.235	<0.001	<0.001
26-2	2440	1.859	42.179	1.79	39.220	3.85	7.55	-0.159	0.261	-0.194	<0.001	<0.001
26-3	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	0.002	0.002
31	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	<0.001	<0.001
32	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	<0.001	<0.001
33	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	<0.001	<0.001
34	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	<0.001	<0.001
35	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	<0.001	<0.001

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SAR Plot	Freq. (MHz)	δ	ϵ_r	Target δ	Target ϵ_r	$\Delta\delta$ %	$\Delta\epsilon_r$ %	C_ϵ 10g	C_δ 10g	Δ SAR 10g	Scaling SAR 10g	Corr. SAR 10g
36	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	0.003	0.003
36-1	2402	1.822	42.228	1.76	39.270	3.52	7.53	-0.157	0.269	-0.235	<0.001	<0.001
36-2	2441	1.86	42.180	1.79	39.220	3.91	7.55	-0.159	0.261	-0.179	<0.001	<0.001
36-3	2480	1.888	42.130	1.82	39.180	3.74	7.53	-0.16	0.253	-0.259	0.003	0.003

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities	
Transmitter Combination	Simultaneous?
RFID with Bluetooth	V
RFID with BLE	V
Bluetooth with BLE	X
RFID with Bluetooth with BLE	X

Simultaneous mode :

1. RFID with Bluetooth
2. RFID with BLE

Simultaneous SAR :

RFID		BLE	BT1M	SAR SUM(W/kg)
RFID(DSB-ASK)	2.383	0.002	X	2.385
RFID(DSB-ASK)	2.383	X	0.003	2.386
RFID(PK-ASK)	2.347	0.002	X	2.349
RFID(PK-ASK)	2.347	X	0.003	2.350

Conclusion:

Compliance.

APPENDIX A MEASUREMENT UNCERTAINTY

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

SAR Uncertainty Budget
According to IEC/IEEE 62209-1528
(Frequency band: 300MHz - 3GHz range)

Symbol	Input quantity $\bar{X}_i$ (source of uncertainty)	Unc. Value	Prob. Dist.	Div.	ci (1g)	ci (10g)	Std.Unc. (1g) (±%)	Std.Unc. (10g) (±%)	Ref.
Measurement system errors									
CF	Probe calibration(±%)	12.0	N	2	1	1	6.0	6.0	8.4.1.1
CF_{drift}	Probe calibration drift(±%)	1.7	R	$\sqrt{3}$	1	1	1.0	1.0	8.4.1.2
LIN	Probe linearity and detection limit(±%)	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	8.4.1.3
BBS	Broadband signal(±%)	2.8	R	$\sqrt{3}$	1	1	1.6	1.6	8.4.1.4
ISO	Probe isotropy(±%)	7.6	R	$\sqrt{3}$	1	1	4.4	4.4	8.4.1.5
DAE	Other probe and data acquisition errors(±%)	0.3	N	1	1	1	0.3	0.3	8.4.1.6
AMB	RF ambient and noise(±%)	1.8	N	1	1	1	1.8	1.8	8.4.1.7
Δ_{pos}	Probe positioning errors(±mm)	0.006	N	1	0.14	0.14	0.08	0.08	8.4.1.8
DAT	Data processing errors(±%)	1.2	N	1	1	1	1.2	1.2	8.4.1.9
Phantom and device (DUT or validation antenna) errors									
$LQ(\sigma)$	Conductivity (meas.)(±%)	2.5	N	1	0.78	0.71	2.0	1.8	8.4.2.1
$LQ(T_0)$	Conductivity (temp.)(±%)	3.2	R	$\sqrt{3}$	0.78	0.71	1.4	1.3	8.4.2.2
EPS	Phantom Permittivity(±%)	14	R	$\sqrt{3}$	0	0	0.0	0.0	8.4.2.3
DIS	Distance DUT - TSL(±%)	2	N	1	2	2	4.0	4.0	8.4.2.4
D_{pos}	Device Positioning(±%)	0.2	N	1	1	1	0.2	0.2	8.4.2.5
H	Device Holder(±%)	1.6	N	1	1	1	1.6	1.6	8.4.2.6
MOD	DUT Modulationm(±%)	2.4	R	$\sqrt{3}$	1	1	1.4	1.4	8.4.2.7
TAS	Time-average SAR(±%)	1.7	R	$\sqrt{3}$	1	1	1.0	1.0	8.4.2.8
RF_{drift}	DUT drift(±%)	5	N	1	1	1	5.0	5.0	8.4.2.9
VAL	Val Antenna Unc.(±%)	0	N	1	1	1	0.0	0.0	8.4.2.10
P_{in}	Unc. Input Power(±%)	0	N	1	1	1	0.0	0.0	8.4.2.11
Corrections to the SAR result									
$C(\varepsilon', \sigma)$	Deviation to Target(±%)	1.9	N	1	1	0.84	1.9	1.6	8.4.3.1
$C(R)$	SAR scaling(±%)	0	R	$\sqrt{3}$	1	1	0.0	0.0	8.4.3.2
$u(\Delta S, \Delta R)$	Combined uncertainty						11.3	11.2	
U	Expanded uncertainty					$U =$	22.5	22.3	
a Other probability distributions and divisors may be used if they better represent available knowledge of the quantities concerned.									

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SAR Uncertainty Budget
According to IEC/IEEE 62209-1528
(Frequency band: 3GHz - 6GHz range)

Symbol	Input quantity X_i (source of uncertainty)	Unc. Value	Prob. Dist.	Div.	ci (1g)	ci (10g)	Std.Unc. (1g) (±%)	Std.Unc. (10g) (±%)	Ref.
Measurement system errors									
CF	Probe calibration(±%)	13.1	N	2	1	1	6.6	6.6	8.4.1.1
CF_{drift}	Probe calibration drift(±%)	1.7	R	$\sqrt{3}$	1	1	1.0	1.0	8.4.1.2
LIN	Probe linearity and detection limit(±%)	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	8.4.1.3
BBS	Broadband signal(±%)	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	8.4.1.4
ISO	Probe isotropy(±%)	7.6	R	$\sqrt{3}$	1	1	4.4	4.4	8.4.1.5
DAE	Other probe and data acquisition errors(±%)	0.3	N	1	1	1	0.3	0.3	8.4.1.6
AMB	RF ambient and noise(±%)	1.8	N	1	1	1	1.8	1.8	8.4.1.7
Δ_{sys}	Probe positioning errors(±mm)	0.005	N	1	0.29	0.29	0.15	0.15	8.4.1.8
DAT	Data processing errors(±%)	2.3	N	1	1	1	2.3	2.3	8.4.1.9
Phantom and device (DUT or validation antenna) errors									
$LIQ(\sigma)$	Conductivity (meas.)(±%)	2.5	N	1	0.78	0.71	2.0	1.8	8.4.2.1
$LIQ(T_e)$	Conductivity (temp.)(±%)	2.5	R	$\sqrt{3}$	0.78	0.71	1.1	1.0	8.4.2.2
EPS	Phantom Permittivity(±%)	14	R	$\sqrt{3}$	0.25	0.25	2.0	2.0	8.4.2.3
DIS	Distance DUT - TSL(±%)	2	N	1	2	2	4.0	4.0	8.4.2.4
D_{sys}	Device Positioning(±%)	2.6	N	1	1	1	2.6	2.6	8.4.2.5
H	Device Holder(±%)	1.5	N	1	1	1	1.5	1.5	8.4.2.6
MOD	DUT Modulationm(±%)	2.4	R	$\sqrt{3}$	1	1	1.4	1.4	8.4.2.7
TAS	Time-average SAR(±%)	1.7	R	$\sqrt{3}$	1	1	1.0	1.0	8.4.2.8
RF_{drift}	DUT drift(±%)	5	N	1	1	1	5.0	5.0	8.4.2.9
VAL	Val Antenna Unc.(±%)	0	N	1	1	1	0.0	0.0	8.4.2.10
P_{in}	Unc. Input Power(±%)	0	N	1	1	1	0.0	0.0	8.4.2.11
Corrections to the SAR result									
$c(\varepsilon', \sigma)$	Deviation to Target(±%)	1.9	N	1	1	0.84	1.9	1.6	8.4.3.1
$c(R)$	SAR scaling(±%)	0	R	$\sqrt{3}$	1	1	0.0	0.0	8.4.3.2
$u(\Delta S, \Delta R)$	Combined uncertainty						12.1	12.0	
U	Expanded uncertainty					$U =$	24.3	24.1	
a Other probability distributions and divisors may be used if they better represent available knowledge of the quantities concerned.									

APPENDIX B EUT TEST POSITION PHOTOS

Please Refer to the Attachment APPENDIX B EUT TEST POSITION PHOTOS_1127

APPENDIX C SAR PLOTS OF SAR MEASUREMENT

Please Refer to the Attachment APPENDIX C SAR PLOTS OF SAR MEASUREMENT_1127

APPENDIX D PROBE & DAE CALIBRATION CERTIFICATES

Please refer to the file document APPENDIX D PROBE & DAE CALIBRATION CERTIFICATES

APPENDIX E DIPOLE CALIBRATION CERTIFICATES

Please refer to the file document APPENDIX E DIPOLE CALIBRATION CERTIFICATES_1127

******* END OF REPORT *******