



SAR TEST REPORT

FCC 47 CFR § 2.1093 IEEE Std 1528-2013

for

7.8" Color Digital Note Pad

Model Name.: E70P24

Prepared for:

NETRONIX, INC. No. 945, Boai St., Jubei City, Hsin-Chu, 30265, Taiwan

Prepared by

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New Taipei City, Taiwan.

Issue Date: November 29, 2023

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Page: 2/32 Rev.: 01

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	November 23, 2023	Initial Issue	ALL	Peggy Tsai
01	November 29, 2023	See the following Note Rev. (01)	P.6	Peggy Tsai

Rev. (01):

^{1.} Modify Model Discrepancy in section 3.1.



Page: 3/32 Rev.: 01

Table of Contents

1	AT1	ESTATION OF TEST RESULTS	4
2	TES	ST SPECIFICATION, METHODS AND PROCEDURES	5
3	DE	/ICE UNDER TEST (DUT) INFORMATION	6
	3.1	DUT DESCRIPTION	
	3.2	WIRELESS TECHNOLOGIES	7
4	SAF	R MEASUREMENT SYSTEM	8
	4.1	SYSTEM COMPONENTS	9
	4.2	SAR SCAN PROCEDURES	12
5	ME	ASUREMENT UNCERTAINTY	14
6	RF	EXPOSURE CONDITIONS (TEST CONFIGURATIONS)	15
	6.1	STANDALONE SAR TEST EXCLUSION CONSIDERATIONS	15
	6.2	REQUIRED TEST CONFIGURATIONS	16
7	DIE	LECTRIC PROPERTY MEASUREMENTS & SYSTEM CHECK	17
	7.1	DIELECTRIC PROPERTY MEASUREMENTS	17
	7.2	SYSTEM CHECK	20
8	CO	NDUCTED OUTPUT POWER MEASUREMENTS	22
	8.1	WI-FI 2.4GHZ (DTS BAND)	22
	8.2	WI-FI 5GHZ (U-NII BANDS)	23
	8.3	BLUETOOTH	24
9	ME	ASURED AND REPORTED (SCALED) SAR RESULTS	26
	9.1	WI-FI (DTS BAND)	26
	9.2	WI-FI (U-NII BAND)	26
10	SAF	R MEASUREMENT VARIABILITY	27
11	SIM	ULTANEOUS TRANSMISSION SAR ANALYSIS	28
	11.1	SUM OF THE SAR FOR WI-FI & BT	30
12	EQ	JIPMENT LIST & CALIBRATION STATUS	31
13	FAC	CILITIES	32
14	API	PENDIXES	32



Page: 4/32 Rev.: 01

1 Attestation of Test Results

Applicant Name	NETRONIX, INC.						
Model Name	E70P24						
Applicable Standards	FCC 47 CFR § 2.1093	FCC 47 CFR § 2.1093					
	Published RF exposure	KDB procedures					
	IEEE Std 1528-2013						
	SAR Limits (W/Kg)						
Exposure Category		Peak spatial-average					
	(1g of tissue)						
General population	1.6						
DE Evenaura Conditions	Equipment Class - Highest Reported SAR (W/kg)						
RF Exposure Conditions	DTS	NII	DSS				
Body	0.956	1.146	0				
Simultaneous TX	1.314						
Receive EUT Date:	October 13, 2023						
Date Tested	October 18, 2023 to Oc	toberr 19, 2023					
Test Results	Pass						

Compliance Certification Services Inc., tested the above equipment in accordance with the requirements set forth in the above standards. Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainy. All indications of Pass/Fail in this report are opinions expressed by Compliance Certification Services Inc, based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved & Released By:	Tested by:
Spr Thou	Jack Yang
Sky Zhou	Jack Yang
Asst. Section Manager	Engineer
Compliance Certification Services Inc.	Compliance Certification Services Inc.



Page: 5 / 32
Report No.: TMWK2310003650KS Rev.: 01

2 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528- 2013, the following FCC Published RF exposure KDB procedures:

- o 248227 D01 802.11 Wi-Fi SAR v02r02
- o 447498 D01 General RF Exposure Guidance v06
- o 616217 D04 SAR for laptop and tablets v01r02
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- o 865664 D02 RF Exposure Reporting v01r02

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

o TCB workshop October, 2016; Page 7, RF Exposure Procedures (Bluetooth Duty Factor)



Page: 6/32 Rev.: 01

3 Device Under Test (DUT) Information

3.1 DUT Description

3.1 DOI Descrip	LIOII								
Applicant Name	NETRONIX, INC.								
Applicant Address	No. 945, Boai St., Ju	bei City, Hsin-Chu, 30265, Taiv	van						
Manufacturer Name	NETRONIX, INC.								
Manufacturer Address	No. 945, Boai St., Ju	No. 945, Boai St., Jubei City, Hsin-Chu, 30265, Taiwan							
Product	7.8" Color Digital Not	te Pad							
Trade Name	MobiScribe								
Model No.	E70P24								
Model Discrepancy	Adding EPD Panel v	vith two different configurations	as follows:						
	1. Configured with th	e new Digitizer on the newly me	odified PCBA.						
	2. Configured with th	e old Digitizer and the old PCB							
		Update Model	Original Model						
	Panel (CFA)	EC078KH7	EC078KH5						
	Wacom Digitizer	SUEE-07S01MI-02X	SUDE-07S01MI-01A						
	PCBA	B3	B2						
	Overall (Length x Wi	dth): 195 mm x 148 mm							
Device Dimension	Overall Diagonal: 24								
	Display Diagonal: 19	7 mm							
	☐ Normal Battery Co	ver							
	☐ Normal Battery Co	ver with NFC							
Back Cover	☐ Wireless Charger E	Battery Cover							
	☐ Wireless Charger E	Battery Cover with NFC							
		not removable.							
		i-ion battery, Rating 3.85Vdc, 9.6	63Wh						
Battery Options	☐ Extended (large ca	pacity)							
	☐ The rechargeable I	pattery is not user accessible.							
Hardware Version	Version B								
Software Version	V6.0.0-eaab786-68_2	20230804.211103							
Sample Stage	PVT								



Page: 7/32 Report No.: TMWK2310003650KS Rev.: 01

3.2 Wireless Technologies

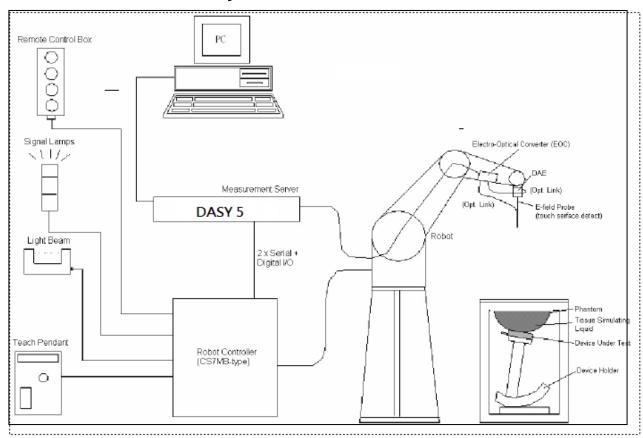
Wireless technologies	Frequency bands	Peak Antenna Gain (dBi)	Operating mode	Duty Cycle used for SAR testing
			802.11b	100% _(802.11b)
	2.4 GHz	2.64	802.11g	96.82% (802.11g)
			802.11n 20	97.91% (802.11n 20MHz BW)
Wi-Fi	5.011		802.11a	96.52% _(802.11a)
		5.72	802.11n/ac 20	97.91% (802.11n/ac 20MHz BW)
	5 GHz		802.11n/ac 40	95.86% _(802.11n/ac 40MHz BW)
			802.11ac 80	91.49% (802.11ac 80MHz BW)
Bluetooth	2.4 GHz	2.64	BR, EDR, LE	76.8%
	Brand Name	INPAQ Tec	hnology Co., Ltd.	
Antenna	Туре	PCB Anten	na	
Specification	Parts Number	RFPCA310	710EMLB301	

- The sample selected for test was prototype that representative to production product and was provided by manufacturer Variant information between/among model numbers / trademarks is provided by the applicant, test results of this report are applicable to the sample EUT received of main test model name.
- Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received
- The device turns off U-NII-2A,U-NII-2C and U-NII-3.



Page: 8 / 32
Report No.: TMWK2310003650KS Rev.: 01

4 SAR Measurement System



The DASY5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (St aubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- 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 between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected 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.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7 or Windows XP.
- DASY software version: NEO52 D10.3 S14.6.13.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.



Page: 9 / 32
Report No.: TMWK2310003650KS Rev.: 01

4.1 System Components

DASY5 Measurement Server



The DASY5 measurement server is based on a PC/104 CPU board with a 166MHz low-power Pentium, 32MB chip disk and 64MB RAM. The necessary circuits for communication with either the DAE4 electronic 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 for 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 two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server. Calibration: No calibration required.

Data Acquisition Electronics (DAE)



The data acquisition electronics (DAE4) consists 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 and 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 the DAE4 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



Page: 10/32 Report No.: TMWK2310003650KS Rev.: 01

EX3DV4 Isotropic E-Field Probe for Dosimetric Measurements



Construction:

Symmetrical design with triangular core Built-in shielding against static charges

PEEK enclosure material (resistant to organic solvents.

e.g., DGBE)

Calibration:

Basic Broad Band Calibration in air: 10-3000 MHz. Conversion Factors (CF) for HSL 900 and HSL 1800 CF-Calibration for other liquids and frequencies upon

Frequency:

10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3

GHz)

Directivity:

± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in HSL (rotation normal to probe axis)

Dynamic Range: 10 µW/g to > 100 mW/g; Linearity: ± 0.2 dB (noise: typically $< 1 \mu W/g$)

Dimensions:

Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm)

Application:

Distance from probe tip to dipole centers: 1 mm High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

SAM Phantom



Construction: The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE1528: 2013. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.

Shell Thickness:2 ±0.2 mm Filling Volume: Approx. 25 liters

Dimensions: Height: 810mm; Length: 1000mm; Width: 500mm

ELI Phantom



Construction: Phantom for compliance testing of handheld and bodymounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEEE1528: 2013 and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. 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 is supported by software version DASY5 and higher and is compatible with all SPEAG dosimetric probes and dipoles

Shell Thickness: 2.0 ± 0.2 mm (sagging: <1%)

Filling Volume: Approx. 25 liters

Dimensions: Major ellipse axis: 600 mm

Minor axis: 400 mm 500mm



Report No.: TMWK2310003650KS Rev.: 01

Device Holder for SAM Twin Phantom



Construction:

In combination with the Twin SAM Phantom V4.0 or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head,

Page: 11/32

and flat phantom).

System Validation Kits for SAM Phantom



Construction: Symmetrical dipole with 1/4

balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and

tripod adaptor.

Frequency: 2450, 5300, 5600, 5800 MHz

> 20 dB at specified validation position **Return loss:** Power capability: > 100 W (f < 1 GHz); > 40 W (f > 1 GHz)

Dimensions: D2450V2: dipole length: 51.5 mm; overall height: 290

D5GHzV2: dipole length: 20.6 mm; overall height:

300 mm

System Validation Kits for ELI phantom



Construction: Symmetrical dipole with 1/4 balun **Enables**

measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod

adaptor.

2450, 5300, 5600, 5800 MHz Frequency:

Return loss: > 20 dB at specified validation position Power capability: > 100 W (f < 1 GHz); > 40 W (f > 1 GHz)

Dimensions: D2450V2: dipole length: 51.5 mm; overall height: 290

D5GHzV2: dipole length: 20.6 mm; overall height: 300

mm



Page: 12 / 32

Report No.: TMWK2310003650KS Rev.: 01

4.2 SAR Scan Procedures

Step 1: Power Reference Measurement

The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

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 IEEE1528 standards, 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	½·δ·ln(2) ± 0.5 mm
Maximum probe abgle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: ΔxZoom,	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
ΔyZoom	measurement plane orie above, the measuremen corresponding x or y dim	on of the test device, in the ntation, is smaller than the t resolution must be ≤ the tension of the test device with nt 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.

Page: 13 / 32

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

Zoom Scan Parameters ex			≤ 3 GHz	> 3 GHz	
Maximum zoom scan spat	tial resolutio	≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm	3 – 4 GHz: ≤ 5 mm 4 – 6 GHz: ≤ 4 mm		
	Unifor	m grid: Δzzoom(n)	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm	
Maximum zoom scan spatial resolution, normal to phantom surface	graded	Δzz _{oom} (1):between 1st two points losest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm	
	grid	Δzz _{oom} (n>1): between subsequent points	≤ 1.5·Δzzoom(n-1)		
Maximum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm		

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

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction



Page: 14 / 32
Report No.: TMWK2310003650KS Rev.: 01

5 Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\le 30\%$, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE1528: 2013 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.



Page: 15 / 32
Report No.: TMWK2310003650KS Rev.: 01

6 RF Exposure Conditions (Test Configurations)

Refer to Appendixes 1 for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

6.1 Standalone SAR Test Exclusion Considerations

Since the *Dedicated Host Approach* is applied, the standalone SAR test exclusion procedure in KDB 447498 is applied in conjunction with KDB 616217 § 4.3 to determine the minimum test separation distance:

- When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
- When the separation distance from the antenna to an adjacent edge is > 5 mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion.

SAR Test Exclusion Calculations for WLAN

Antennas < 50mm to adjacent edges

Tx	Frequency	Output Power Separation Distances (mm)						Calcula	ated Threshole	d Value			
Interface	(MHz)	dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Rear	Edge 1	Edge 2	Edge 3	Edge 4
Wi-Fi 2.4 GHz	2462	13.00	20	5	103	185	10	5	6.3 -MEASURE-	> 50 mm	> 50 mm	3.1 -MEASURE-	6.3 -MEASURE-
Wi-Fi 5.2 GHz	5240	8.25	7	5	103	185	10	5	3.2 -MEASURE-	> 50 mm	> 50 mm	1.6 -EXEMPT-	3.2 -MEASURE-
Bluetooth	2480	5.50	4	5	103	185	10	5	1.3 -EXEMPT-	> 50 mm	> 50 mm	0.6 -EXEMPT-	1.3 -EXEMPT-

Note(s):

According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

SAR Test Exclusion Calculations for WLAN

Antennas > 50mm to adjacent edges

Tx Frequency Output Power		Separation Distances (mm)					Calculated Threshold Value						
Interface	(MHz)	dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Rear	Edge 1	Edge 2	Edge 3	Edge 4
Wi-Fi 2.4 GHz	2462	13.00	20	5	103	185	10	5	< 50 mm	625.6 mW -EXEMPT-	1445.6 mW -EXEMPT-	< 50 mm	< 50 mm
Wi-Fi 5.2 GHz	5240	8.25	7	5	103	185	10	5	< 50 mm	595.5 mW -EXEMPT-	1415.5 mW -EXEMPT-	< 50 mm	< 50 mm
Bluetooth	2480	5.50	4	5	103	185	10	5	< 50 mm	625.3 mW -EXEMPT-	1445.3 mW -EXEMPT-	< 50 mm	< 50 mm

Note(s):

According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.



Page: 16 / 32
Report No.: TMWK2310003650KS Rev.: 01

6.2 Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 6.1:

Test Configurations	Rear	Edge 1	Edge 3	Edge 4
Wi-Fi 2.4 GHz	Yes	No	Yes	Yes
Wi-Fi 5.2 GHz	Yes	No	No	Yes
Bluetooth	No	No	No	No

Note(s):

Yes = Testing is required.

No = Testing is not required.



Page: 17 / 32
Report No.: TMWK2310003650KS Rev.: 01

7 Dielectric Property Measurements & System Check

7.1 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° 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 (ϵr) 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 ϵr and σ may be relaxed to \pm 10%. This is limited to frequencies \leq 3 GHz.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Torget Frequency (MI Iz)	H	lead	Body		
Target Frequency (MHz)	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	

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013



Page: 18 / 32
Report No.: TMWK2310003650KS Rev.: 01

Typical Composition of Ingredients for Liquid Tissue Phantoms

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients					Frequen	cy (MHz)			
(% by weight)	4:	50	83	35	9′	15	19	00	2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

alt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose Water: De-ionized, 16 $M\Omega^+$ resistivity HEC: Hydroxy thyl Cellulose DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra-pure): Polyethylene glycol mono [4-(1, 1, 3, 3-tetramethylbutyl)phenyl]ether

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2



Page: 19 / 32 Rev.: 01

Dielectric Property Measurements Results:

5.	Tissue	Frequency	Relativ	e Permittiv	ity (ɛr)	Conductivity (σ)			
Date	Туре	(MHz)	Measured	Target	Delta (%)	Measured	Target	Delta (%)	
	Head	2400	40.46	39.30	2.95	1.73	1.76	-1.59	
2023/10/18		2450	40.22	39.20	2.60	1.79	1.80	-0.50	
		2480	40.10	39.16	2.40	1.83	1.83	-0.16	
	Head	5150	36.75	36.05	1.94	4.49	4.61	-2.52	
2023/10/19		5200	36.61	36.00	1.69	4.55	4.66	-2.36	
		5250	36.54	35.95	1.64	4.61	4.71	-2.21	



Page: 20 / 32
Report No.: TMWK2310003650KS Rev.: 01

7.2 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 ±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 ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 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 15 mm (below 1 GHz) and 10 mm (above 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. For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube
- Distance between probe sensors and phantom surface was set to 2 mm.
- The dipole input power (forward power) was 250 mW (below 2GHz) and 100 mW
- The results are normalized to 1 W input power.



Page: 21 / 32
Report No.: TMWK2310003650KS Rev.: 01

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 2 for the SAR System Check Plots.

Date	Tissue Type	Dipole S/N	Input Power (mW)	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Delta 1g ±10 (%)	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Delta 10g ±10 (%)	Plot No.
2023/10/18	Head	D2450V2-727	250	13.00	53.10	52	-2.07	6.56	24.80	26.24	5.81	1
2023/10/19	Head	D5GHzV2-1349-5250	100	8.38	80.40	83.8	4.23	2.41	23.00	24.1	4.78	2



Page: 22 / 32
Report No.: TMWK2310003650KS Rev.: 01

8 Conducted Output Power Measurements

8.1 Wi-Fi 2.4GHz (DTS Band)

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11g/n/ac/ax mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.

SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Measured Results

Band	Mode	Data Rate	Ch#	Freq. (MHz)	Meas. Avg Pwr(dBm)	Tune-up Limit (dBm)	SAR Test (Yes/No)	
			1	2412	12.69			
	802.11b	1 Mbps	6	2437	12.71	13.0	Yes	
			11	2462	12.70			
	802.11g	6 Mbps	1	2412	12.51			
2.4GHz (DTS)			6	2437	12.52	13.0	No	
(510)			11	2462	12.50			
			1	2412	12.67			
	802.11n (HT20)	MCS0	6	2437	12.68	13.0	No	
	(11120)		11	2462	12.65			



Page: 23 / 32 Rev.: 01

8.2 Wi-Fi 5GHz (U-NII Bands)

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected.

SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output powermeasurements were not deemed necessary.

Measured Results

MCasarca IV	- Count						
Band	Mode	Data Rate	Ch#	Freq. (MHz)	Meas. Avg Pwr (dBm)	Tune-up Limit (dBm)	SAR Test (Yes/No)
			36	5180	8.09		
	902.116	G Mbna	40	5200	8.03	0.05	No
	802.11a	6 Mbps	44	5220	7.93	8.25	INO
			48	5240	8.05		
-			36	5180	7.38		
	802.11n (HT20)	MCS0	40	5200	7.29	0.05	No
			44	5220	7.18	8.25	No
			48	5240	7.30		
5.2GHz			36	5180	7.38		
(U-NII 1)	802.11ac		40	5200	7.29	0.05	Na
	(VHT20)	MCS0	44	5220	7.18	8.25	No
			48	5240	7.20		
	802.11n	MCCO	38	5190	7.37	0.05	Ne
	(HT40)	MCS0	46	5230	7.36	8.25	No
	802.11ac	MCSO	38	5190	7.21	0.25	No
	(VHT40)	MCS0	46	5230	7.19	8.25	No
	802.11ac (VHT80)	MCS0	42	5210	7.23	8.25	Yes



Page: 24 / 32
Report No.: TMWK2310003650KS Rev.: 01

8.3 Bluetooth.

Average Power Measured Results

Band (GHz)	Mode	Data Rate	Ch#	Freq. (MHz)	Meas. Avg Pwr (dBm)	Meas. Avg Pwr (mW)	Tune-up Limit (dBm)	SAR Test (Yes/No)	
			0	2402	5.21	3.32		No	
	GFSK	1 Mbps	39	2441	5.16	3.28	5.5		
			78	2480	5.07	3.21			
	EDR, π/4 DQPSK		0	2402	2.41	1.74			
		2 Mbps	39	2441	2.34	1.71	3.0	No	
2.4			78	2480	2.19	1.66			
2.4			0	2402	2.40	1.74			
	EDR, 8-DPSK	3 Mbps	39	2441	2.28	1.69	3.0	No	
	o Broit		78	2480	2.19	1.66			
			0	2402	4.25	2.66			
	LE, GFSK	1 Mbps	19	2440	4.20	2.63	4.5	No	
	0.0.0		39	2480	4.12	2.58			

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
GFSK	DH5	2.88	3.75	76.80%	1.15



Page: 25 / 32 Rev.: 01

Duty Cycle plots

GFSK





Page: 26 / 32
Report No.: TMWK2310003650KS Rev.: 01

9 Measured and Reported (Scaled) SAR Results

9.1 Wi-Fi (DTS Band)

J.1 11	(6	o Dana,									
RF		Dist.			Freq.		Pow er	(dBm)	1-g SAI	R (W/kg)	Plot
Exposure Conditions	Mode	(mm)	Test Position	Ch #.	(MHz)	Duty Cycle	Tune-up Limit	Meas.	Meas.	Scaled	No.
		lb 0	Rear	1	2412	100.00%	13.0	12.69	0.812	0.872	
			Rear	6	2437	100.00%	13.0	12.71	0.758	0.810	
Body	802.11b		Rear	11	2462	100.00%	13.0	12.70	0.892	0.956	1
			Edge 3	6	2437	100.00%	13.0	12.71	0.094	0.100	
			Edge 4	6	2437	100.00%	13.0	12.71	0.677	0.724	

9.2 Wi-Fi (U-NII Band)

RF	Frequency		Dist.			Freq	Freq. (MHz) Duty Cycle	Pow er (dBm)		1-g SAR (W/kg)		Plot
Exposu Conditio	e Band	Mode	(mm)	Test Position	Ch #.			Tune-up Limit	Meas.	Meas.	Scaled	No.
Body	5.2GHz	802.11ac	0	Rear	42	5210	91.49%	8.25	7.23	0.564	0.780	
Войу	(U-NII 1)	(VHT80)	U	Edge 4	42	5210	91.49%	8.25	7.23	0.829	1.146	2



Page: 27 / 32
Report No.: TMWK2310003650KS Rev.: 01

10 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.Wi-Fi (U-NII Band)

Wi-Fi (DTS Band)

RF		Dist.	Test Position	Ch #.	Freg.		Meas. SA	R (W/kg)	Largest to
Exposure Conditions	Mode	(mm)			(MHz)	Duty Cycle	Original	Repeated	Smallest SAR Ratio
Body	802.11b	0	Rear	11	2462	100.0%	0.892	0.827	1.08

Wi-Fi (U-NII Band)

(
RF	RF		Dist.		Ch #.	Freq.		Meas. SA	R (W/kg)	Largest to
Exposure Conditions	Exposure Conditions	Mode	(mm)	Test Position		(MHz)	Duty Cycle	Original	Repeated	Smallest SAR Ratio
Body	5.2GHz (U-NII 1)	802.11ac (VHT80)	0	Edge 4	42	5210	91.49%	0.829	0.727	1.14

Note(s):

Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is < 1.20.



Page: 28 / 32
Report No.: TMWK2310003650KS Rev.: 01

11 Simultaneous Transmission SAR Analysis

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.

SAR to Peak Location Ratio (SPLSR)

KDB 447498 D01 General RF Exposure Guidance explains how to calculate the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas: SPLSR = (SAR₁ + SAR₂)^{1.5} /Ri

Where:

SAR₁ is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

 SAR_2 is the highest measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

In order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$(SAR_1 + SAR_2)^{1.5} / Ri \le 0.04$

When an individual antenna transmits at on two bands simultaneously, the sum of the highest reported SAR for the frequency bands should be used to determine SAR1.or SAR2. When SPLSR is necessary, the smallest distance between the peak SAR locations for the antenna pair with respect to the peaks from each antenna should be used.

The antennas in all antenna pairs that do not qualify for simultaneous transmission SAR test exclusion must be tested for SAR compliance, according to the enlarged zoom scan and volume scan post-processing procedures in KDB Publication 865664 D01



Page: 29 / 32 Rev.: 01

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations					
Standalone	1	DTS	+	BT			
	2	U-NII	+	BT			



Page: 30 / 32 Report No.: TMWK2310003650KS Rev.: 01

Estimated SAR for Simultaneous Transmission SAR Analysis Considerations for SAR estimation

- 1. When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
- 2. Dedicated Host Approach criteria for SAR test exclusion is likewise applied to SAR estimation, with certain distinctions between test exclusion and SAR estimation:
 - When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied for SAR estimation; this is the same between test exclusion and SAR estimation calculations.
 - When the separation distance from the antenna to an adjacent edge is > 5 mm but ≤ 50 mm, the actual antenna-to-edge separation distance is applied for SAR estimation.
 - When the minimum test separation distance is > 50 mm, the estimated SAR value is 0.4 W/kg
- 3. Please refer to Estimated SAR Tables to see which test positions are inherently compliant as they consist of only estimated SAR values for all applicable transmitters and consequently will always have sum of SAR values < 1.2 W/kg. Simultaneous transmission SAR analysis was therefore not performed for these test positions.

Estimated SAR for WLAN

Tx	Output	Power		Separation Distances (mm)				Estimated 1-g SAR Value (W/kg)				
Interface	dBm	m W	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Rear	Edge 1	Edge 2	Edge 3	Edge 4
Wi-Fi 2.4 GHz	13.00	20	5	103	185	10	5	-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-
Wi-Fi 5.2 GHz	8.25	7	5	103	185	10	5	-MEASURE-	0.400	0.400	0.214	-MEASURE-
Bluetooth	5.50	4	5	103	185	10	5	0.168	0.400	0.400	0.084	0.168

11.1 Sum of the SAR for Wi-Fi & BT

Test	Standa	alone SAR	(W/kg)	∑ 1-g SAR (W/kg)			
Position	DTS	U-NII	BT	DTS + BT	U-NII + BT		
	1	2	3	(I) + (3)	2+3		
Rear	0.956	0.780	0.168	1.124	0.948		
Edge 3	0.100	0.214	0.084	0.184	0.298		
Edge 4	0.724	1.146	0.168	0.892	1.314		

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.



Page: 31 / 32 Rev.: 01

12 Equipment List & Calibration Status

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. Due Date			
Dielectric Assessment Kit	SPEAG	DAKS-3.5	1053	2024/2/26			
Thermometer	TES	TES-1306	210801061	2023/10/20			

System Check				
Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Signal Generator	Agilent	N5181A	MY50145826	2024/9/21
Pow er Meter	Anritsu	ML2496A	2136002	2023/11/23
Pow er Sensor	Anritsu	MA2411B	1911386	2024/7/24
Pow er Sensor	Agilent	MA2411B	1911387	2024/7/24
Dual Directional Coupler	Agilent	772D	MY46151258	2024/9/25
Amplifier	EMCI	ZVE-8G	S1900977	N/A
Data Acquisition Electronice	SPEAG	DAE4	547	2024/6/18
Dosimetric E-Field Probe	SPEAG	EX3DV4	3665	2024/8/17
System Validation Dipole	SPEAG	D2450V2	727	2024/4/24
System Validation Dipole	SPEAG	D5GHzV2	1349	2024/3/19
Humidity/Temp meter	TECPEL	DTM-303A	TP131515	2024/6/1
Thermometer	TES	TES-1306	210801061	2023/10/20

Software Version
DASY NEO52 D10.3 S14.6.13
SEMCAD-X-PostPro



Page: 32 / 32 Report No.: TMWK2310003650KS Rev.: 01

13 Facilities

All measurement facilities used to collect the measurement data are located at

☑ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

14 Appendixes

Exhibit	Content
1	SAR Setup Photos
2	SAR System Check Plots
3	Highest SAR Test Plots
4	SAR DAE and Probe Calibration Certificates
5	SAR Dipole Calibration Certificates

END OF REPORT