FCC SAR TEST REPORT

FCC ID	: 2AJN7-TP00159AL
Equipment	: Convertible PC
Brand Name	: Lenovo
Model Name	: TP00159D, TP00159E
Applicant	: LC Future Center Limited Taiwan Branch 7F., No.780, Beian Rd., Zhongshan Dist., Taipei 104, Taiwan
Manufacturer	: Lenovo PC HK Limited 23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong, P.R. China
Standard	: FCC 47 CFR Part 2 (2.1093)

Equipment: Quetel EM061K-GL and MediaTek MT7925B14L tested inside of Lenovo Notebook Computer.

The product was received on Feb. 13, 2025 and testing was started from Feb. 16, 2025 and completed on Feb. 17, 2025. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been pass the FCC requirement.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Laboratory, the test report shall not be reproduced except in full.

Cona Huang

Approved by: Cona Huang / Deputy Manager

Sporton International Inc. Wensan Laboratory

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History of this test report

Report No.	Version	Description	Issued Date
FA3N1049-17	01	Initial issue of report	Mar. 17, 2024

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) for LC Future Center Limited Taiwan Branch, Convertible PC, TP00159D, TP00159E, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary Body 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
Licensed	WCDMA II	1.13	1.19
	WCDMA IV	1.19	
	WCDMA V	1.09	
	LTE Band 7	0.63	
	LTE Band 12 / 17	1.19	
	LTE Band 13	1.17	
	LTE Band 14	1.14	
	LTE Band 2 / 25	1.10	
	LTE Band 5 / 26	1.19	
	LTE Band 30	1.17	
	LTE Band 38 / 41	0.50	
	LTE Band 4 / 66	1.09	
	LTE Band 71	1.01	
Date of Testing:		2025/2/16 ~ 2025/2/17	

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation and the FCC designation No. TW3786 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

Reviewed by: Jason Wang
Report Producer: Daisy Peng

2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards, the below KDB standard may not including in the TAF code without accreditation.

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	Convertible PC
Brand Name	Lenovo
Model Name	TP00159D, TP00159E
FCC ID	2AJN7-TP00159AL
Integrated WWAN Module	Brand Name: Quetel Model Name: EM061K-GL
Integrated WLAN Module	Brand Name: MediaTek Model Name: MT7925B14L
Integrated NFC Module	Brand Name: Foxconn Model Name: T77H747
Wireless Technology and Frequency Range	WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2 GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3 GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6 GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8 GHz Band: 5725 MHz ~ 5850 MHz WLAN 5.9 GHz Band: 5850 MHz ~ 5895 MHz WLAN 6E: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz NFC: 13.56 MHz
Mode	RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM WLAN: 802.11a/b/g/n/ac/ax/be HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160/EHT20/EHT40/EHT80/EHT160/EHT320 Bluetooth BR/EDR/LE NFC: ASK
EUT Stage	Production Unit

Remark:

1. WWAN based on original report, Sporton SAR Report, report number: FA3N1049-01 and FA3N1049-08 variant report to Spot check each bands. The MediaTek MT7925B14L (FCC ID: RAS-MT7925B14L) also into this host, the Sim-Tx compliance with WWAN operation was addressed in section12.
2. The AL and PPS platform different is WiFi/BT antenna location

Sample List	Antenna Vendor	Platform
Sample 1	AWAN	AL
Sample 2	Amphenol	AL
Sample 3	AWAN	PPS
Sample 4	Amphenol	PPS

WWAN Antenna Information				
Main Antenna	Manufacturer	Amphenol Taiwan Corporation	Peak gain(dBi)	0.98
	Part number	DC330022K70	Type	PIFA
	Manufacturer	AWAN	Peak gain(dBi)	0.98
	Part number	DC330022H70	Type	PIFA

3.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	2AJN7-TP00159AL
Equipment Name	Convertible PC
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz
Channel Bandwidth	LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz LTE Band 14: 5MHz, 10MHz LTE Band 17: 5MHz, 10MHz LTE Band 25:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz LTE Band 30: 5MHz, 10MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 66:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 71: 5MHz, 10MHz, 15MHz, 20MHz
uplink modulations used	QPSK / 16QAM
LTE Voice / Data requirements	Data only
LTE MPR permanently built-in by design	**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3** Modulation | Channel bandwidth / Transmission bandwidth (N_{RB}) | MPR (dB) 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz QPSK: > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 16 QAM: ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 16 QAM: > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 64 QAM: ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 2 64 QAM: > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 3 256 QAM: ≥ 1 | ≤ 5
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
Power reduction applied to satisfy SAR compliance	Yes, Proximity and G-Sensor and power verification refer to original report.
LTE Carrier Aggregation Combinations	Inter-Band and Intra-Band possible combinations and the detail power measurement refer to original report
LTE Carrier Aggregation Additional	This device supports maximum of 2 carriers in the downlink. Additional following LTE

Information	Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 5

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 7

	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 12

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 13

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5	23230	782
M	23230	782		
H	23255	784.5		

LTE Band 14

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Channel #	Channel #	Freq.(MHz)
L	23305	790.5	23330	793
M	23330	793		
H	23355	795.5		

LTE Band 17

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq. (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

LTE Band 25												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26047	1850.7	26055	1851.5	26065	1852.5	26090	1855	26115	1857.5	26140	1860
M	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880
H	26683	1914.3	26675	1913.5	26665	1912.5	26640	1910	26615	1907.5	26590	1905

LTE Band 26										
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26697	814.7	26705	815.5	26715	816.5	26740	819	26765	821.5
M	26865	831.5	26865	831.5	26865	831.5	26865	831.5	26865	831.5
H	27033	848.3	27025	847.5	27015	846.5	26990	844	26965	841.5

LTE Band 30				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	27685	2307.5	27710	2310
M	27710	2310		
H	27735	2312.5		

LTE Band 38								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610

LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506
L M	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593
H M	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680

LTE Band 66												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	131979	1710.7	131987	1711.5	131997	1712.5	132022	1715	132047	1717.5	132072	1720
M	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745
H	132665	1779.3	132657	1778.5	132647	1777.5	132622	1775	132597	1772.5	132572	1770

LTE Band 71								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	133147	665.5	133172	668	133197	670.5	133222	673
M	133297	680.5	133297	680.5	133297	680.5	133297	680.5
H	133447	695.5	133422	693	133397	690.5	133372	688

4. RF Exposure Limits

4.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

4.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

5. Specific Absorption Rate (SAR)

5.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

5.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

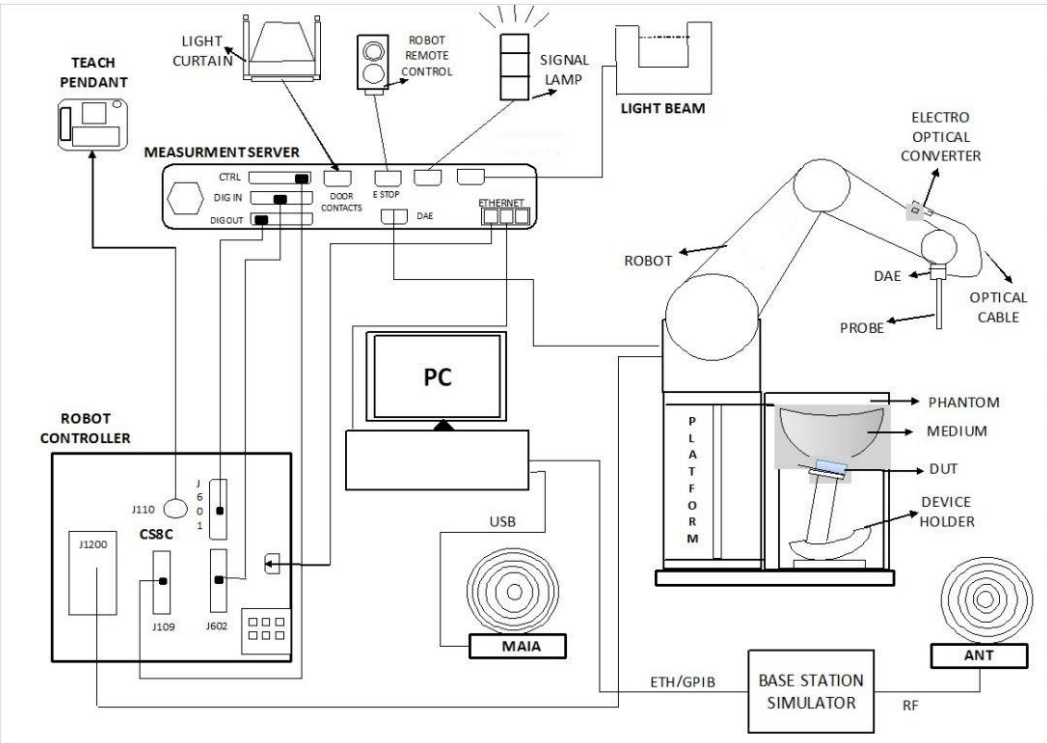
SAR is expressed in units of Watts per kilogram (W/kg)

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^2}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

6. System Description and Setup

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



- The DASY system in SAR Configuration is shown above
- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running windows software and the DASY 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.

6.1 Test Site Location

The SAR measurement facilities used to collect data are within both Sporton Lab list below test site location are accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190 and 3786) and the FCC designation No. TW1190 and TW3786 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

Test Site	EMC & Wireless Communications Laboratory		Wensan Laboratory		
Test Site Location	TW1190 No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333		TW3786 No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010		
Test Site No.	SAR01-HY	SAR03-HY	SAR08-HY	SAR09-HY	SAR15-HY
	SAR04-HY	SAR05-HY	SAR11-HY	SAR12-HY	SAR16-HY
	SAR06-HY	SAR10-HY	SAR13-HY	SAR14-HY	SAR17-HY
			SAR18-HY		

6.2 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	4 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)	
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	4 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 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 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

6.3 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) 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.

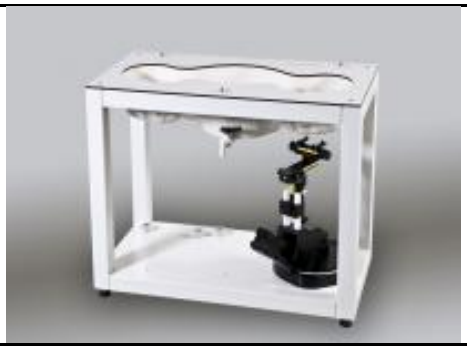
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

6.4 Phantom

<SAM Twin Phantom>

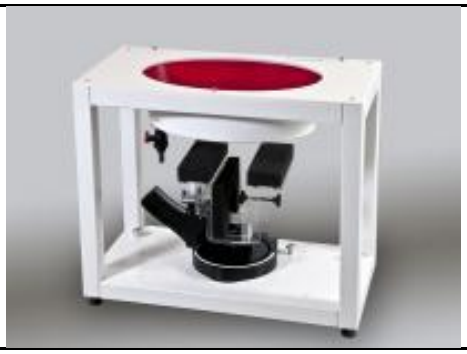
Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm



The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

6.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

7. Measurement Procedures

The measurement procedures are as follows:

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

7.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

7.2 Power Reference Measurement

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

7.3 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 found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 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 FCC KDB 865664 D01v01r04 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 angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

7.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes 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 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

7.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

7.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

8. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit(2)	D750V3	1107	Jun. 22, 2022	Jun. 19, 2025
SPEAG	835MHz System Validation Kit(2)	D835V2	4d167	Nov. 24, 2022	Nov. 21, 2025
SPEAG	1750MHz System Validation Kit(2)	D1750V2	1120	Mar. 25, 2022	Mar. 22, 2025
SPEAG	1900MHz System Validation Kit(2)	D1900V2	5d185	Jun. 17, 2022	Jun. 14, 2025
SPEAG	2300MHz System Validation Kit	D2300V2	1006	Jan. 14, 2025	Jan. 13, 2026
SPEAG	2600MHz System Validation Kit	D2600V2	1008	Aug. 15, 2024	Aug. 14, 2025
SPEAG	Data Acquisition Electronics	DAE4	1647	Oct. 15, 2024	Oct. 14, 2025
SPEAG	Dosimetric E-Field Probe	EX3DV4	7814	Jun. 20, 2024	Jun. 19, 2025
Testo	Hygro meter	608-H1	45196600	Oct. 28, 2024	Oct. 27, 2025
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Nov. 12, 2024	Nov. 11, 2025
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Sep. 24, 2024	Sep. 23, 2025
Keysight	ENA Network Analyzer	E5071C	MY46104758	Oct. 20, 2024	Oct. 19, 2025
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 17, 2024	Sep. 16, 2025
LINE SEIKI	Digital Thermometer	DTM3000-spezial	3690	Aug. 07, 2024	Aug. 06, 2025
Anritsu	Power Meter	ML2495A	1419002	Aug. 13, 2024	Aug. 12, 2025
Anritsu	Power Sensor	MA2411B	1911176	Aug. 13, 2024	Aug. 12, 2025
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jul. 09, 2024	Jul. 08, 2025
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 23, 2024	Oct. 22, 2025
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Warison	Directional Coupler	WCOU-10-50S-10	WR889BMC4B1	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

9. System Verification

9.1 Tissue Verification

The tissue dielectric parameters of tissue-equivalent media used for SAR measurements must be characterized within a temperature range of 18℃ to 25℃, measured with calibrated instruments and apparatuses, such as network analyzers and temperature probes. The temperature of the tissue-equivalent medium during SAR measurement must also be within 18℃ to 25℃ and within ± 2℃ of the temperature when the tissue parameters are characterized. The tissue dielectric measurement system must be calibrated before use. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements.
The liquid tissue depth was at least 15cm in the phantom for all SAR testing

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	22.6	0.889	41.810	0.89	41.90	-0.11	-0.21	±5	2025/2/16
835	22.6	0.923	41.514	0.90	41.50	2.56	0.03	±5	2025/2/16
1750	22.7	1.370	40.487	1.37	40.10	0.00	0.97	±5	2025/2/17
1900	22.7	1.384	40.234	1.40	40.00	-1.14	0.59	±5	2025/2/17
2300	22.7	1.622	38.726	1.67	39.50	-2.87	-1.96	±5	2025/2/17
2300	22.6	1.629	40.392	1.67	39.50	-2.46	2.26	±5	2025/2/26
2600	22.7	1.945	37.382	1.96	39.00	-0.77	-4.15	±5	2025/2/17
2600	22.6	1.925	39.285	1.96	39.00	-1.79	0.73	±5	2025/2/26

9.2 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)	Test Site
2025/2/16	750	50	D750V3-1107	EX3DV4 - SN7814	DAE4 Sn1647	0.417	8.540	8.34	-2.34	0.280	5.570	5.6	0.54	SAR-12
2025/2/16	835	50	D835V2-4d167	EX3DV4 - SN7814	DAE4 Sn1647	0.515	9.800	10.3	5.10	0.341	6.380	6.82	6.90	SAR-12
2025/2/17	1750	50	D1750V2-1120	EX3DV4 - SN7814	DAE4 Sn1647	1.840	36.400	36.8	1.10	0.999	19.100	19.98	4.61	SAR-12
2025/2/17	1900	50	D1900V2-5d185	EX3DV4 - SN7814	DAE4 Sn1647	1.830	39.000	36.6	-6.15	0.968	20.400	19.36	-5.10	SAR-12
2025/2/17	2300	50	D2300V2-1006	EX3DV4 - SN7814	DAE4 Sn1647	2.250	48.200	45	-6.64	1.080	23.200	21.6	-6.90	SAR-12
2025/2/26	2300	50	D2300V2-1006	EX3DV4 - SN7814	DAE4 Sn1647	2.260	48.200	45.2	-6.22	1.090	23.200	21.8	-6.03	SAR-12
2025/2/17	2600	50	D2600V2-1008	EX3DV4 - SN7814	DAE4 Sn1647	2.630	55.700	52.6	-5.57	1.190	25.300	23.8	-5.93	SAR-12
2025/2/26	2600	50	D2600V2-1008	EX3DV4 - SN7814	DAE4 Sn1647	2.630	55.700	52.6	-5.57	1.210	25.300	24.2	-4.35	SAR-12

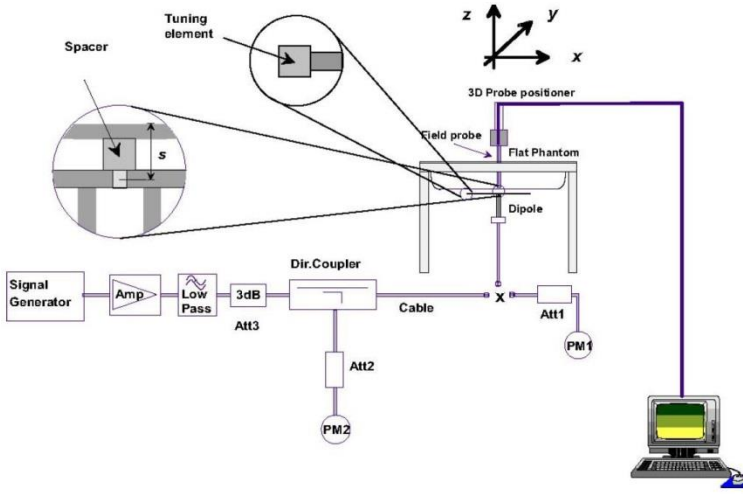


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

10. UMTS/LTE Output Power (Unit: dBm)

<WCDMA>

Band		WCDMA II_Sensor ON			Tune-up Limit (dBm)	WCDMA IV_Sensor ON			Tune-up Limit (dBm)	WCDMA V_Sensor ON			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		1312	1413	1513		4132	4182	4233	
Rx Channel		9662	9800	9938		1537	1638	1738		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		1712.4	1732.6	1752.6		826.4	836.4	846.6	
3GPP Rel 99	RMC 12.2Kbps	17.41	17.38	17.34	18.00	17.29	17.33	17.38	18.00	22.41	22.43	22.57	23.00

<LTE Band 12_Sensor OFF>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				23060	23095	23130	
Frequency (MHz)				704	707.5	711	
10	QPSK	1	0	23.03	23.17	23.16	24.5

<LTE Band 30_Sensor OFF>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel					27710		
Frequency (MHz)					2310		
10	QPSK	1	0		21.29		23
10	QPSK	1	25		21.19		
10	QPSK	1	49		21.19		
10	QPSK	25	0		20.35		22
10	QPSK	25	12		20.31		
10	QPSK	25	25		20.34		
10	QPSK	50	0		20.41		
10	16QAM	1	0		20.42		22
10	16QAM	1	25		20.55		
10	16QAM	1	49		20.47		
10	16QAM	25	0		19.40		21
10	16QAM	25	12		19.45		
10	16QAM	25	25		19.41		
10	16QAM	50	0		19.41		
Channel				27685	27710	27735	Tune-up limit (dBm)
Frequency (MHz)				2307.5	2310	2312.5	
5	QPSK	1	0	21.10	21.28	21.24	23
5	QPSK	1	12	21.19	21.05	21.05	
5	QPSK	1	24	21.19	21.05	21.19	
5	QPSK	12	0	20.22	20.28	20.12	22
5	QPSK	12	7	20.29	20.27	20.27	
5	QPSK	12	13	20.33	20.37	20.28	
5	QPSK	25	0	20.23	20.30	20.30	
5	16QAM	1	0	20.27	20.38	20.40	22
5	16QAM	1	12	20.39	20.41	20.47	
5	16QAM	1	24	20.38	20.31	20.36	
5	16QAM	12	0	19.20	19.28	19.37	21
5	16QAM	12	7	19.39	19.36	19.29	
5	16QAM	12	13	19.36	19.39	19.21	
5	16QAM	25	0	19.41	19.34	19.37	

<LTE Band 7_Sensor ON>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				20850	21100	21350	
Frequency (MHz)				2510	2535	2560	
20	QPSK	1	0	13.60	13.72	13.59	14.5

<LTE Band 13_Sensor ON>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				23230			
Frequency (MHz)				782			
10	QPSK	1	0		22.49		23.5

<LTE Band 14_Sensor ON>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				23330			
Frequency (MHz)				793			
10	QPSK	1	0		22.95		23.5

<LTE Band 25_Sensor ON>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				26140	26340	26590	
Frequency (MHz)				1860	1880	1905	
20	QPSK	1	0	17.06	17.06	17.07	18

<LTE Band 26_Sensor ON>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				26765	26865	26965	
Frequency (MHz)				821.5	831.5	841.5	
15	QPSK	1	0	22.64	22.69	22.68	23.5

<LTE Band 30_Sensor ON>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel					27710		
Frequency (MHz)					2310		
10	QPSK	1	0		15.36		15.5
10	QPSK	1	25		15.35		
10	QPSK	1	49		15.34		
10	QPSK	25	0		14.46		15
10	QPSK	25	12		14.48		
10	QPSK	25	25		14.47		
10	QPSK	50	0		14.56		
10	16QAM	1	0		14.75		15
10	16QAM	1	25		14.72		
10	16QAM	1	49		14.66		
10	16QAM	25	0		13.57		15
10	16QAM	25	12		13.59		
10	16QAM	25	25		13.55		
10	16QAM	50	0		13.56		
Channel				27685	27710	27735	Tune-up limit (dBm)
Frequency (MHz)				2307.5	2310	2312.5	
5	QPSK	1	0	15.30	15.18	15.27	15.5
5	QPSK	1	12	15.31	15.22	15.22	
5	QPSK	1	24	15.30	15.21	15.19	
5	QPSK	12	0	14.44	14.28	14.33	15
5	QPSK	12	7	14.40	14.33	14.41	
5	QPSK	12	13	14.38	14.45	14.43	
5	QPSK	25	0	14.57	14.49	14.48	
5	16QAM	1	0	14.72	14.66	14.74	15
5	16QAM	1	12	14.58	14.56	14.72	
5	16QAM	1	24	14.58	14.63	14.60	
5	16QAM	12	0	13.52	13.55	13.55	15
5	16QAM	12	7	13.53	13.39	13.40	
5	16QAM	12	13	13.35	13.50	13.46	
5	16QAM	25	0	13.46	13.43	13.43	

<LTE Band 66_Sensor ON>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				132072	132322	132572	
Frequency (MHz)				1720	1745	1770	
20	QPSK	1	0	17.00	16.97	16.92	18

<LTE Band 71_Sensor ON>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				133222	133297	133372	
Frequency (MHz)				673	680.5	688	
20	QPSK	1	0	23.38	23.40	23.42	24.5

<LTE Band 41_Sensor ON>									
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				39750	40185	40620	41055	41490	
Frequency (MHz)				2506	2549.5	2593	2636.5	2680	
20	QPSK	1	0	15.05	15.08	15.12	15.05	14.84	16

<SAR test exclusion table>

General Note:

1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v06, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v06, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
6. Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

	Wireless Interface	WCDMA Band V	WCDMA Band IV	WCDMA Band II	LTE Band 71	LTE Band 12	LTE Band 13	LTE Band 14	LTE Band 17	LTE Band 5	LTE Band 26	LTE Band 4	LTE Band 66	LTE Band 2	LTE Band 25	LTE Band 30	LTE Band 7	LTE Band 38	LTE Band 41
Exposure Position	Calculated Frequency (MHz)	846	1750	1907	695	715	784	795	713	848	848	1754	1779	1909	1914	2312	2567	2617	2687
	Maximum power (dBm)	25.0	25.0	25.0	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	23.0	24.0	24.0	24.0
	Maximum rated power(mW)	316.23	316.23	316.23	281.84	281.84	281.84	281.84	281.84	281.84	281.84	281.84	281.84	281.84	281.84	199.53	251.19	251.19	251.19
Bottom Side	Separation distance(mm)	5.0																	
	exclusion threshold	58.2	83.7	87.3	47.0	47.7	49.9	50.3	47.6	51.9	51.9	74.7	75.2	77.9	78.0	60.7	80.5	81.3	82.4
	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

11. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   c. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

11.1 Body SAR

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Sample	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	ON	9538	1907.6	Sample 2	17.34	18.00	1.164	0.15	0.970	1.129
	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	ON	9262	1852.4	Sample 2	17.41	18.00	1.146	0.08	0.942	1.079
	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	ON	9400	1880	Sample 2	17.38	18.00	1.153	0.01	0.901	1.039
02	WCDMA IV	RMC 12.2Kbps	Bottom Side	0mm	ON	1312	1712.4	Sample 4	17.29	18.00	1.178	0.16	1.010	1.189
	WCDMA IV	RMC 12.2Kbps	Bottom Side	0mm	ON	1413	1732.6	Sample 4	17.33	18.00	1.167	0.03	0.969	1.131
	WCDMA IV	RMC 12.2Kbps	Bottom Side	0mm	ON	1513	1752.6	Sample 4	17.38	18.00	1.153	-0.08	0.927	1.069
03	WCDMA V	RMC 12.2Kbps	Bottom Side	0mm	ON	4132	826.4	Sample 2	22.41	23.00	1.146	0.09	0.866	0.992
	WCDMA V	RMC 12.2Kbps	Bottom Side	0mm	ON	4233	846.6	Sample 2	22.57	23.00	1.104	-0.08	0.833	0.920
	WCDMA V	RMC 12.2Kbps	Bottom Side	0mm	ON	4182	836.4	Sample 2	22.43	23.00	1.140	0.1	0.844	0.962

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Sample	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
04	LTE Band 7	20M	QPSK	1	0	Bottom Side	0mm	ON	21100	2535	Sample 4	13.72	14.50	1.197			0.03	0.404	0.483
05	LTE Band 12	10M	QPSK	1	0	Bottom Side	0mm	OFF	23095	707.5	Sample 1	23.17	24.50	1.358			-0.03	0.877	1.191
06	LTE Band 13	10M	QPSK	1	0	Bottom Side	0mm	ON	23230	782	Sample 4	22.49	23.50	1.262			-0.01	0.923	1.165
07	LTE Band 14	10M	QPSK	1	0	Bottom Side	0mm	ON	23330	793	Sample 4	22.95	23.50	1.135			0	0.989	1.123
08	LTE Band 25	20M	QPSK	1	0	Bottom Side	0mm	ON	26590	1905	Sample 2	17.07	18.00	1.239			0.08	0.838	1.038
	LTE Band 25	20M	QPSK	1	0	Bottom Side	0mm	ON	26140	1860	Sample 2	17.06	18.00	1.242			-0.18	0.786	0.976
	LTE Band 25	20M	QPSK	1	0	Bottom Side	0mm	ON	26340	1880	Sample 2	17.06	18.00	1.242			0.1	0.829	1.029
09	LTE Band 26	15M	QPSK	1	0	Bottom Side	0mm	ON	26865	831.5	Sample 4	22.69	23.50	1.205			-0.03	0.987	1.189
10	LTE Band 30	10M	QPSK	1	0	Bottom Side	0mm	ON	27710	2310	Sample 1	15.36	15.50	1.033			-0.11	1.130	1.167
	LTE Band 30	10M	QPSK	25	12	Bottom Side	0mm	ON	27710	2310	Sample 1	14.48	15.00	1.127			0.08	1.030	1.161
	LTE Band 30	10M	QPSK	50	0	Bottom Side	0mm	ON	27710	2310	Sample 1	14.56	15.00	1.107			0.01	0.924	1.023
	LTE Band 30	10M	QPSK	1	0	Bottom Side	24mm	OFF	27710	2310	Sample 1	21.29	23.00	1.483			0.1	0.162	0.240
	LTE Band 30	10M	QPSK	25	0	Bottom Side	24mm	OFF	27710	2310	Sample 1	20.35	22.00	1.462			-0.18	0.117	0.171
	LTE Band 30	10M	QPSK	1	0	Bottom Side	0mm	ON	27710	2310	Sample 2	15.36	15.50	1.033			0.08	0.737	0.761
	LTE Band 30	10M	QPSK	1	0	Bottom Side	0mm	ON	27710	2310	sample 3	15.36	15.50	1.033			0.18	1.020	1.053
	LTE Band 30	10M	QPSK	1	0	Bottom Side	0mm	ON	27710	2310	Sample 4	15.36	15.50	1.033			-0.03	1.060	1.095
11	LTE Band 41	20M	QPSK	1	0	Bottom Side	0mm	ON	40185	2549.5	Sample 4	15.08	16.00	1.236	62.9	1.006	0.05	0.356	0.443
12	LTE Band 66	20M	QPSK	1	0	Bottom Side	0mm	ON	132072	1720	sample 2	17.00	18.00	1.259			-0.06	0.391	0.492
13	LTE Band 71	20M	QPSK	1	0	Bottom Side	0mm	OFF	133297	680.5	sample 2	23.40	24.50	1.288			0.08	0.786	1.013

11.2 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Sample	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	ON	9538	1907.6	Sample 2	17.34	18.00	1.164	0.15	0.970	-	1.129
2nd	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	ON	9538	1907.6	Sample 2	17.34	18.00	1.164	0.11	0.948	1.03	1.104
1st	WCDMA IV	RMC 12.2Kbps	Bottom Side	0mm	ON	1312	1712.4	Sample 4	17.29	18.00	1.178	0.16	1.010	-	1.189
2nd	WCDMA IV	RMC 12.2Kbps	Bottom Side	0mm	ON	1312	1712.4	Sample 4	17.29	18.00	1.178	0.13	0.986	1.02	1.161
1st	LTE Band 14	10M_QPSK_1_0_	Bottom Side	0mm	ON	23330	793	Sample 4	22.95	23.50	1.135	0	0.989	-	1.123
2nd	LTE Band 14	10M_QPSK_1_0_	Bottom Side	0mm	ON	23330	793	Sample 4	22.95	23.50	1.135	0.01	0.968	1.02	1.099
1st	LTE Band 26	15M_QPSK_1_0_	Bottom Side	0mm	ON	26865	831.5	Sample 4	22.69	23.50	1.205	-0.03	0.987	-	1.189
2nd	LTE Band 26	15M_QPSK_1_0_	Bottom Side	0mm	ON	26865	831.5	Sample 4	22.69	23.50	1.205	-0.05	0.969	1.02	1.168
1st	LTE Band 30	10M_QPSK_1_0_	Bottom Side	0mm	ON	27710	2310	Sample 1	15.36	15.50	1.033	-0.11	1.130	-	1.167
2nd	LTE Band 30	10M_QPSK_1_0_	Bottom Side	0mm	ON	27710	2310	Sample 1	15.36	15.50	1.033	-0.11	1.010	1.12	1.043

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

12. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	WWAN + WLAN Main + WLAN/BT Aux	Yes

General Note:

1. The WWAN data refers to Sporton Report No.: FA3N1049-01 and FA3N1049-08. The MediaTek MT7925B14L (FCC ID: RAS-MT7925B14L) is also into this host to evaluate simultaneous transmission.
2. WiFi/BT SAR of 1.59 W/kg for each transmit antenna was used conservatively for the purpose of simultaneous transmission analysis.
3.
4. The Scaled SAR summation is calculated based on the same configuration and test position.
5. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
   v) The SPLSR calculated results please refer to section 12.2.

12.1 Body Exposure Conditions

<AL Platform>

Exposure Position	1	2	3	1+2+3 Summed 1g SAR (W/kg)	1+2+3 SPLSR	1+2+3 Case No
	Maximum WWAN	WLAN Main	WLAN/BT Aux			
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)			
Bottom Side at 0mm	1.191	1.590	1.590	4.371	0.020	Case 1

<PPS Platform>

Exposure Position	1	2	3	1+2+3 Summed 1g SAR (W/kg)	1+2+3 SPLSR	1+2+3 Case No
	Maximum WWAN	WLAN Main	WLAN/BT Aux			
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)			
Bottom Side at 0mm	1.191	1.590	1.590	4.371	0.020	Case 1

12.2 SPLSR Evaluation and Analysis

General Note:

1. According to antenna location of appendix D, the minimum distance between each WWAN/WLAN/BT transmit antenna is using for SPLSR analysis.
2. Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneously transmitting antenna. When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration. Therefore, the adjacent transmit antennas will be summed first, and then the SPLSR calculation will be evaluated with the farther transmitted antennas.
3. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.

<AL Platform>

	Band	Position	SAR (W/kg)	Gap (mm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
Case 1	Maximum WWAN	Bottom Side	1.191	0mm	275.0	2.78	0.02	Not required
	WLAN Main		1.590	0mm				
	Maximum WWAN	Bottom Side	1.191	0mm	220.0	2.78	0.02	Not required
	WLAN/BT Aux		1.590	0mm				

<PPS Platform>

	Band	Position	SAR (W/kg)	Gap (mm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
Case 1	Maximum WWAN	Bottom Side	1.191	0mm	370.0	2.78	0.01	Not required
	WLAN Main		1.590	0mm				
	Maximum WWAN	Bottom Side	1.191	0mm	300.0	2.78	0.02	Not required
	WLAN/BT Aux		1.590	0mm				

Test Engineer： Jefferson Lin

13. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, 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 ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg. Therefore, the measurement uncertainty table is not required in this report.

Declaration of Conformity:
The test results with all measurement uncertainty excluded is presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

14. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[6] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[7] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[8] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

[9] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[10] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[11] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.