TEST REPORT

Applicant:	MediaTek Inc.
Address:	No. 1, Dusing 1st Rd. Hsinchu Science Park Hsinchu City 30078 Taiwan
Equipment Type:	2TX 11ax (WiFi6E) + BT/BLE Combo Card
Model Name:	MT7922A22M
Brand Name:	MediaTek
FCC ID:	RAS-MT7922A22M
Test Standard:	FCC 47 CFR Part 2.1093 (refer section 3.1)
Maximum PD:	5.77 W/m^2
Test Date:	Jul. 28, 2022
Date of Issue:	Aug. 08, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Zhang Jiwei

Checked by: Liyao Zong

Approved by: Wei Yanquan (Chief Engineer)

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Jun. 29, 2022	Initial Issue
Rev. 02	Aug. 08, 2022	Changed the power of 802.11a/ ax (160M), all the data involved are updated

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.
Description	All measurement facilities used to collect the measurement data are located at Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China

1.3 Test Environment Condition

Ambient Temperature	18℃ to 25℃
Ambient Relative Humidity	30% to 70%

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	MediaTek Inc.
Address	No. 1, Dusing 1st Rd. Hsinchu Science Park Hsinchu City 30078 Taiwan

2.2 Manufacturer Information

Manufacturer	N/A
Address	N/A

2.3 General Description for Equipment under Test (EUT)

EUT Name	2TX 11ax (WiFi6E) + BT/BLE Combo Card
Model Name Under Test	MT7922A22M
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.3.1 Host Information:

Product Name	notebook computer
Model Name	ThinkBook 14p G3 ARH
Brand Name	Lenovo

2.3.2 Antenna Information:

Antenna Port	Model Name	Antenna Manufacturer	Antenna Type	Antenna Gain (dBi)								
				2.4 GHz	5.15 - 5.25 GHz	5.25 - 5.35 GHz	5.47 - 5.725 GHz	5.725 - 5.85 GHz	5.925 - 6.425 GHz	6.425 - 6.525 GHz	6.525 - 6.875 GHz	6.875 - 7.125 GHz
Main Antenna	DC33001WT00	Amphenol	PIFA	2.51	-1.69	-1.69	-0.80	-0.48	1.55	0.72	1.93	3.51
Auxiliary Antenna	DC33001WT10		PIFA	0.56	-0.85	0.46	0.60	0.60	-0.14	0.52	0.89	2.53
Main Antenna	DC33001WR00	LUXSHARE-ICT	PIFA	0.01	0.64	-0.73	1.20	1.20	2.53	2.18	3.66	3.79
Auxiliary Antenna	DC33001WR10		PIFA	0.92	-1.63	-1.41	-0.59	-0.54	0.84	0.82	0.47	0.46
Note: The report only shown the antenna which matches the antenna with the highest antenna gain.												

2.4 Ancillary Equipment

Note: Not application.

2.5 Technical Information

Network and Wireless connectivity	Bluetooth (BR+EDR+BLE) 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20/40), VHT20/40 and 802.11ax(HE20/40) 5G WIFI 802.11a, 802.11n(HT20/40), 802.11ac(VHT20/40/80/160) and 802.11ax(HE20/40/80/160), U-NII-1/2A/2C/3 6G WIFI 802.11a, 802.11ax(HE20/40/80/160), U-NII-5/6/7/8

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	6G WLAN	
Frequency Range	802.11a /ax(HE20/HE40/ HE80/HE160)	5925 MHz ~ 6425 MHz
		6425 MHz ~ 6525 MHz
		6525 MHz ~ 6875 MHz
		6875 MHz ~ 7125 MHz
Antenna Type	WLAN: PIFA Antenna	
Hotspot Function	N/A	
Exposure Category	General Population/Uncontrolled exposure	
EUT Stage	Portable Device	
Product	Type	
	☒ Production unit	☐ Identical prototype

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2.1093	Radio frequency radiation exposure evaluation: portable devices
2	ANSI C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
4	FCC KDB 447498 D04	RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices
5	FCC KDB 865664 D02 v01r02	RF Exposure Reporting
6	KDB 248227 D01 v02r02	SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters
7	KDB 616217 D04v01r02	SAR for laptop and tablets
8	IEC TR 63170:2018	Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz

3.2 Device Category and SAR Limit

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user.

Limit for General Population/Uncontrolled exposure should be applied for this device, it is power density for frequencies between 1.5GHz and 100 GHz is 1.0 mW/cm^2= 10 W/m^2

Table of Exposure Limits:

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW / cm ^{2})	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f^2	6
30-300	61.4	0.163	1.0	6
300-1,500	/	/	f/300	6
1,500-100,000	/	/	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f^2	30
30-300	27.5	0.073	0.2	30
300-1,500	/	/	f/1500	30
1,500-100,000	/	/	1.0	30
*f = frequency in MHz * = Plane-wave equivalent power density*				

NOTE:

General Population/Uncontrolled Exposure: Locations where there is the exposure of individuals who have no knowledge or control of their exposure. 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.

Occupational/Controlled Exposure: Locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, 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. This 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.

3.3 Test Result Summary

3.3.1 Highest Power Density

Band	Antenna	Maximum Scaled PD (W/m^2)	Maximum Report PD (W/m^2)
		Body	Body
6G WLAN	Main	**5.77**	**5.77**
6G WLAN	Aux.	3.85	
Limit (W/m^2)		10	
Verdict		Pass	

3.3.2 Highest SAR of Simultaneous Transmission (1 g Value)

Test Mode	Position	Mode	Power Density		1g SAR		Total Exposure Ratio
			(W/m^2)	Limt	(W/kg)	Limt	
Body (Separation 0 mm)							
Laptop	Bottom Side	6G WLAN (Main Antenna)	5.769	10	/	/	**0.970**
		6G WLAN (Auxiliary Antenna)	3.853	10	/	/	
		Bluetooth (Auxiliary Antenna)	/	/	0.013	1.60	
Note: The maximum SAR of Bluetooth refers to the SAR report BL-SZ2260135-701.							

3.4 Test Uncertainty

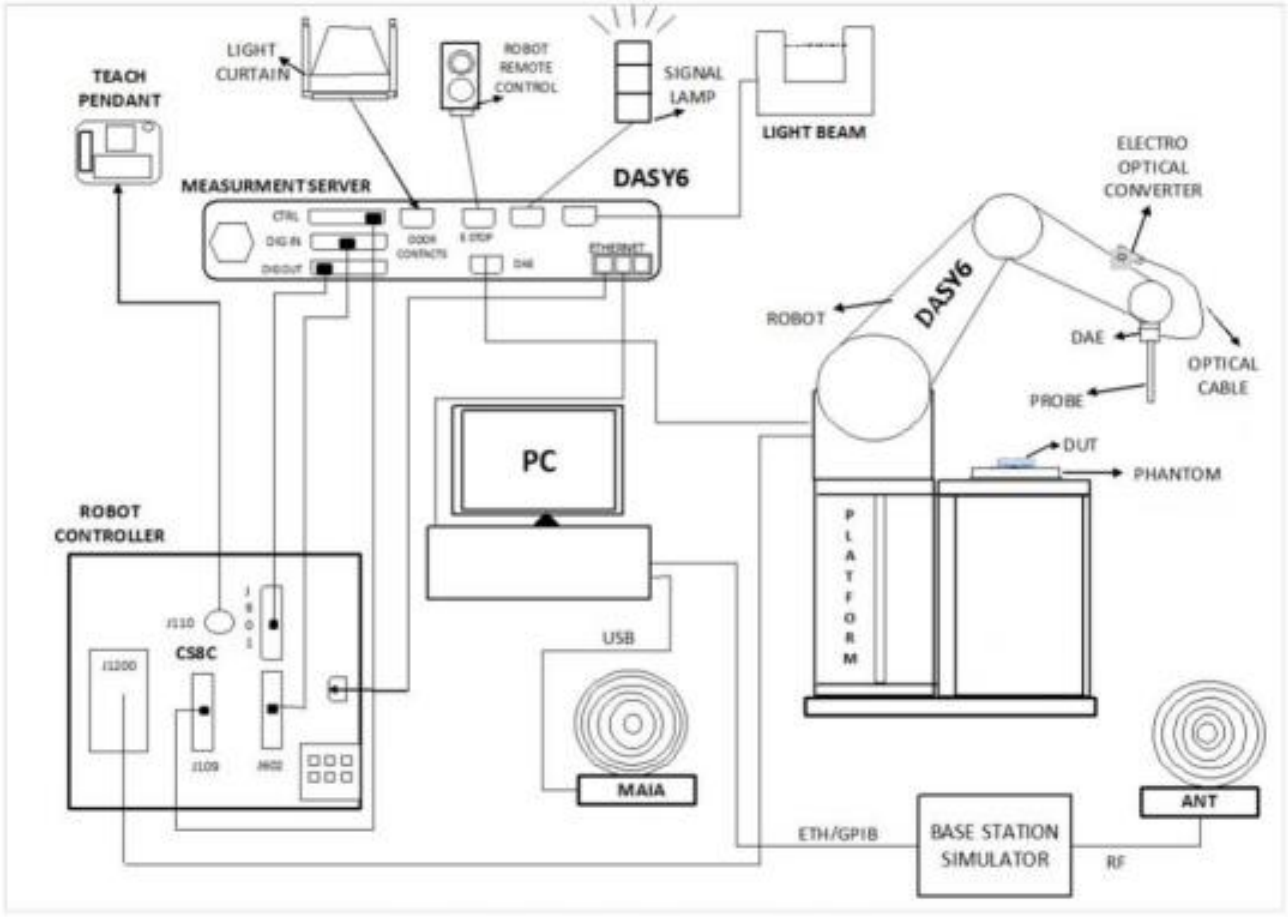
According to TR 63170, the budget is valid for evaluation distances > $\lambda/2\pi$. For specific tests and configurations, the Uncertainty could be considerably smaller.

Uncertainty Component	Unc. (+- dB)	Prob. Dist.	Div.	Ci	Ui (+- dB)	Vi v_{eff}
Measurement System						
Probe calibration	0.49	N	1	1	0.49	∞
Frequency response (BW ⩽ 1 GHz)	0.2	R	1.732	1	0.12	∞
Hemispherical Isotropy	0.50	R	$\sqrt{3}$	1	0.29	∞
Linearity	0.20	R	$\sqrt{3}$	1	0.12	∞
System detection limits	0.04	R	$\sqrt{3}$	1	0.02	∞
Data acquisition	0.03	N	1	1	0.03	∞
Readout Electronics	0.03	N	1	1	0.03	∞
Response Time	0.00	R	$\sqrt{3}$	1	0.00	∞
Integration Time	0.00	R	$\sqrt{3}$	1	0.00	∞
RF ambient Conditions - Noise	0.04	R	$\sqrt{3}$	1	0.02	∞
Probe positioner Mechanical Tolerance	0.04	R	$\sqrt{3}$	1	0.02	∞
Probe positioning with Respect to Phantom	0.30	R	$\sqrt{3}$	1	0.17	∞
S_{avg} Reconstruction	2.00	R	$\sqrt{3}$	1	1.15	∞
Test Sample Related						
Power Drift of Measurement	0.20	R	$\sqrt{3}$	1	0.12	∞
Modulation response	0.40	R	$\sqrt{3}$	1	0.23	∞
Device holder influence	0.10	R	$\sqrt{3}$	1	0.06	∞
RF Ambient Noise	0.04	R	$\sqrt{3}$	1	0.02	∞
RF Ambient Reflections	0.04	R	$\sqrt{3}$	1	0.02	∞
Combined Standard Uncertainty	/	/	RSS		1.33	/
Expanded Uncertainty (95% Confidence interval)	/	k	2		2.66	/

4 MEASUREMENT SYSTEM

4.1 DASY Power Density System

4.1.1 DASY SAR System Diagram



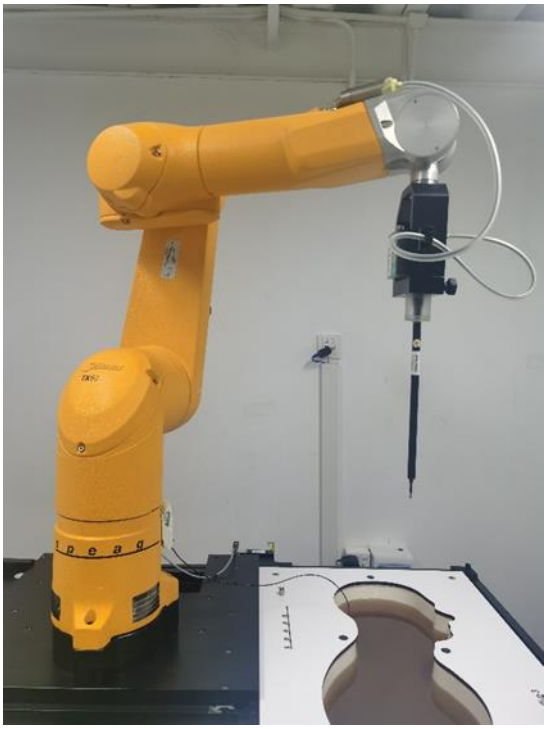
The DASY system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. 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.
3. A data acquisition electronic (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.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY measurement server.
6. The DASY measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.
7. DASY software and SEMCAD data evaluation software.

8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

4.1.2 Robot

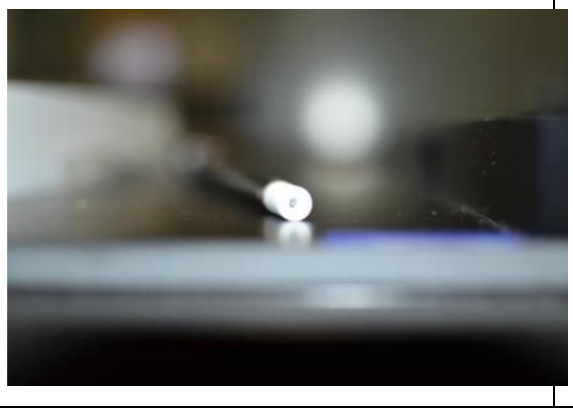
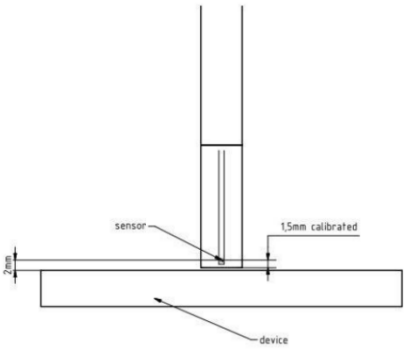
The Dasy SAR system uses the high precision robots. Symmetrical design with triangular core Built-in optical fiber for surface detection system For the 6-axis controller system, Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents). The robot series have many features that are important for our application:



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

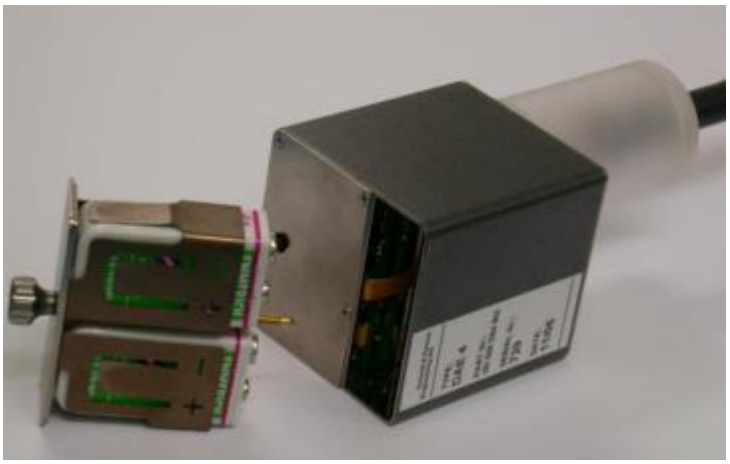
4.1.3 EUmmWave Probe / E-Field 5G Probe

The EUmmWave3 probe design allows measurements at distances as small as 2mm

Frequency	750 MHz – 110 GHz
Probe Overall Length	320 mm
Probe Body Diameter	8.0 mm
Tip Length	23.0 mm
Tip Diameter	8.0 mm
Probe's two dipoles length	0.9 mm – Diode loaded
Dynamic Range	< 20 V/m – 10000 V/m with PRE-10 (min < 50 V/m – 3000 V/m)
Position Precision	< 0.2 mm
Distance between diode sensors and probe's tip	1.5 mm
Minimum Mechanical separation between probe tip and a Surface	0.5 mm
Applications	E-field measurements of 5G devices and other mm-wave transmitters operating above 10GHz in < 2 mm distance from device (free-space) Power density, H-field and far-field analysis using total field reconstruction.
Compatibility	cDASY6 + 5G-Module SW1.0 and higher
	

4.1.4 Data Acquisition Electronics

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



- Input Impedance: 200MOhm
- The Inputs: Symmetrical and Floating
- Commom Mode Rejection: Above 80dB

5 SYSTEM VERIFICATION

5.1 Purpose of System Check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal Power Density measurements in a simplified setup with a well characterized source.This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

5.2 System Check Setup

The system was verified to be within ±0.66 dB of the power density targets on the calibration certificate according to the test system specification in the user’s manual and calibration facility recommendation. The 0.66 dB deviation threshold represents the expanded uncertainty for system performance checks using SPEAG’s mmWave verification sources. The same spatial resolution and measurement region used in the source calibration was applied during the system check.

The measured power density distribution of verification source was also confirmed through visual inspection to have no noticeable differences, both spatially (shape) and numerically (level) from the distribution provided by the manufacturer, per November 2017 TCBC Workshop Notes.

6 POWER DENSITY MEASUREMENT PROCEDURE

6.1 Computation of the Electric Field Polarization Ellipse

For the numerical description of an arbitrarily oriented ellipse in three-dimensional space, five parameters are needed: the semi-major axis (a), the semi-minor axis (b), two angles describing the orientation of the normal vector of the ellipse (ϕ , θ), and one angle describing the tilt of the semi-major axis (Ψ). For the two
extreme cases, i.e. circular and linear polarizations, three parameters only (a, ϕ and θ) are sufficient for
the description of the incident field.

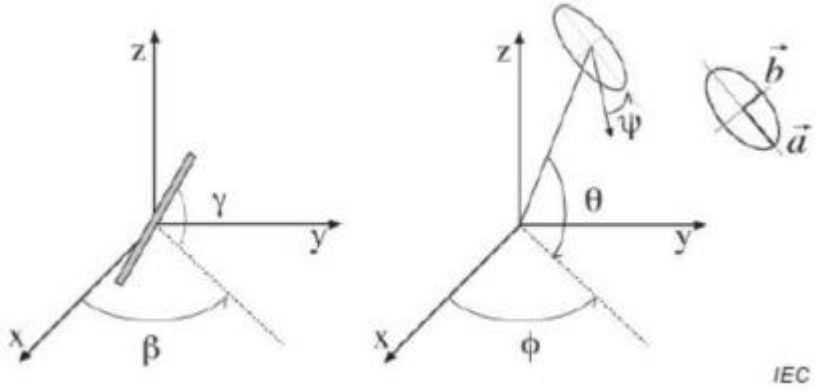


Illustration of the angles used for the numerical description of the sensor and the orientation of an ellipse in 3-D space

For the construction of the ellipse parameters from measured data, the problem can be reformulated as a nonlinear search problem. The semi-major and semi-minor axes of an elliptical field can be express as functions of the three angles (ϕ , θ and Ψ). The parameters can be uniquely determined towards minimizing the error based on least-squares for the given set of angles and the measured data. In this way, the numbers of three parameters is reduced from five to three, which means that least three sensors readings are necessary to gain sufficient information for the reconstruction of ellipse parameters.
However, to suppress the noise and increase the reconstruction accuracy, it is desirable to have an over determined system of equations. The solution to use a probe consisting of two sensors angled by γ 1 and γ 2 toward the probe axis and to perform measurements at three angular positions of the probe, i.e. at β 1, β 2 and β 3, results in over determination of two. If there is a need for more information or increased accuracy, more rotation angles can be added.
The reconstruction of ellipse parameters can be separated into linear and non-linear parts that are best solved by the givens algorithm combined with a downhill simplex algorithm. To minimize the mutual coupling, sensor angles are set with a 90° shift (γ 1= γ 2+90°), and, to simplify, the first rotation angle of the probe (β 1) can be set to 0° .

6.2 Total Field and Power Flux Density Reconstruction

Computation of the power density in general requires knowledge of the electric and magnetic field amplitudes and phases in the plane of incidence. Reconstruction of these quantities from pseudo-vector E-field measurements is feasible, as they are constrained by Maxiwell,s equations. The SPEAG have developed a reconstruction approach based on the Gerchberg-Saxton algorithm, which benefits from the availability of the E-Field polarization ellipse information obtained with the EUmmWV2 probe. This reconstruction algorithm, together with the ability of the probe to measure extremely close to the source without perturbing the field, permits reconstruction of the E-field and H-field, as well as of the power density, on measurement planes located as near as λ /5 away.

6.3 Power Flux Density Averaging

The average of the reconstructed power density is evaluated over a circular area in each measurement plane. The area of the circle is defined by the user; the default is 1cm2. The computed peak average value is displayed in the box at the top right. Note that the average is evaluated only for grid points where the averaging circle is completely filed with values; for points at the edge where the averaging circle is only partly filled with values, the average power density is set to zero. Two average power density values are computed.

6.4 Measurement Workflow: Incident Power Density Measurements with cDASY6 Module mmWave

The incident power density must be measured for the test configuration producing the highest SAR value. The
measurement procedure is summarized below:

1. Perform a system performance check at 10 GHz.
2. Determine the optimal grid resolution to be used for subsequent measurements.
3. Assess the incident power for the configuration to be tested.
4. Calculate the additional reconstruction uncertainty at 2mm and compute the total measurement uncertainty.
5. Adjust the incident psPD results by the amount that the measurement uncertainty exceeds 30%

7 CONDUCTED RF OUPUT POWER

7.1 WIFI

7.1.1 6G WIFI (Main Antenna)

Band (GHz)	Mode	Channel	Freq. (MHz)	Conducted Power (dBm)	Tune-up Power Limit (dBm)	SAR Test Require.
6 (5.925~7.125)	802.11a	1	5955	6.34	8.00	No
		45	6175	6.45	8.00	No
		93	6415	6.76	8.00	No
		97	6435	7.24	8.00	No
		105	6475	6.66	8.00	No
		113	6515	7.05	8.00	No
		117	6535	6.82	8.00	No
		153	6715	6.37	8.00	No
		181	6855	7.35	8.00	No
		185	6875	6.90	8.00	No
		213	7015	7.64	8.00	No
		233	7115	7.43	8.00	No
	802.11ax20	1	5955	0.89	2.00	No
		45	6175	0.69	2.00	No
		93	6415	0.44	1.00	No
		97	6435	1.35	2.00	No
		105	6475	1.52	2.00	No
		113	6515	1.39	2.00	No
		117	6535	1.34	2.00	No
		153	6715	0.56	1.00	No
		181	6855	0.91	2.00	No
		185	6875	1.23	2.00	No
		213	7015	2.01	3.00	No
		233	7115	1.12	2.00	No
	802.11ax40	3	5965	4.18	5.00	No
		43	6165	3.24	4.00	No
		91	6405	3.48	4.00	No
		99	6445	3.68	5.00	No
		107	6485	3.89	4.00	No
		115	6525	3.91	5.00	No
		123	6565	2.83	4.00	No
		155	6725	3.15	4.00	No
		179	6845	3.26	4.00	No
		187	6885	3.93	5.00	No
		211	7005	3.52	4.00	No

		227	7085	4.05	5.00	No
	802.11ax80	7	5985	7.08	8.00	No
		39	6145	6.13	7.00	No
		87	6385	6.67	7.00	No
		103	6465	7.15	8.00	No
		119	6545	6.80	8.00	No
		135	6625	6.76	8.00	No
		151	6705	5.94	7.00	No
		167	6785	6.58	7.00	No
		183	6865	7.17	8.00	No
		199	6945	7.09	8.00	No
		215	7025	6.08	7.00	No
	802.11ax160	15	6025	12.43	13.00	Yes
		47	6185	12.30	13.00	No
		79	6345	12.20	13.00	Yes
		111	6505	**12.61**	13.00	Yes
		143	6665	11.85	13.00	Yes
		175	6825	12.19	13.00	No
		207	6985	12.04	13.00	Yes
	RU-26/0	1	5955	-7.11	-6.00	No
	RU-26/8	93	6415	-8.06	-7.00	No
	RU-26/0	97	6435	-7.15	-6.00	No
	RU-26/0	117	6535	-7.66	-7.00	No
	RU-26/8	181	6855	-7.59	-7.00	No
	RU-26/8	233	7115	-9.38	-9.00	No
	RU-52/40	233	7115	-6.38	-5.00	No
	RU-106/53	1	5955	-2.61	-2.00	No
	RU-106/54	93	6415	-3.06	-2.00	No
	RU-106/53	97	6435	-1.65	-1.00	No
	RU-106/53	117	6535	-1.66	-1.00	No
	RU-106/54	181	6855	-1.59	-1.00	No
	RU-106/54	233	7115	-4.88	-4.00	No

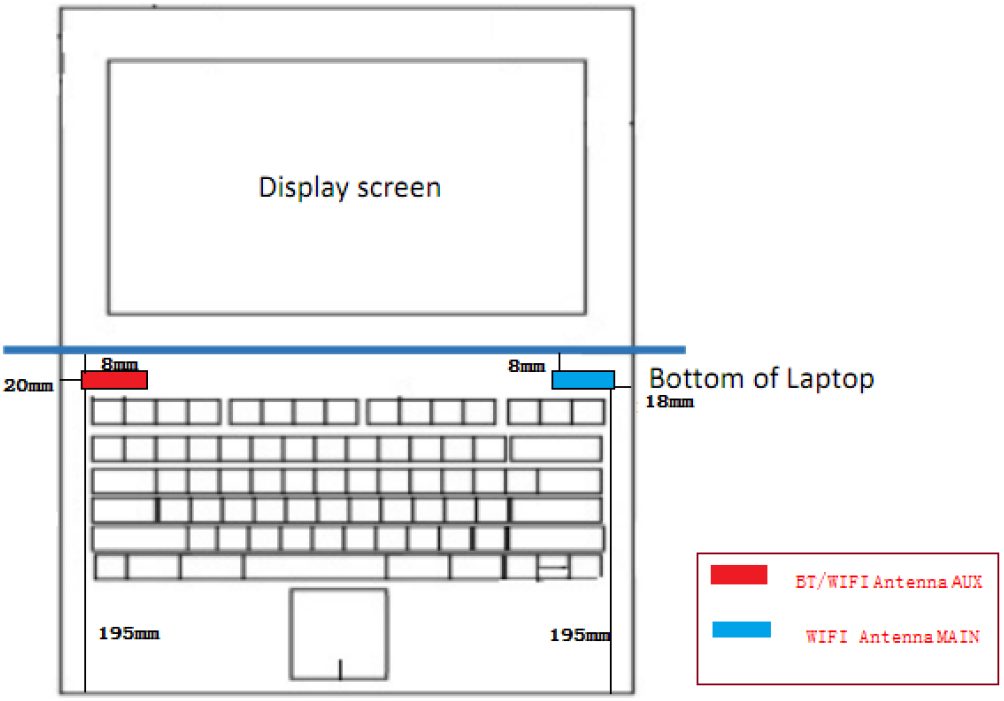
7.1.2 6G WIFI (Aux. Antenna)

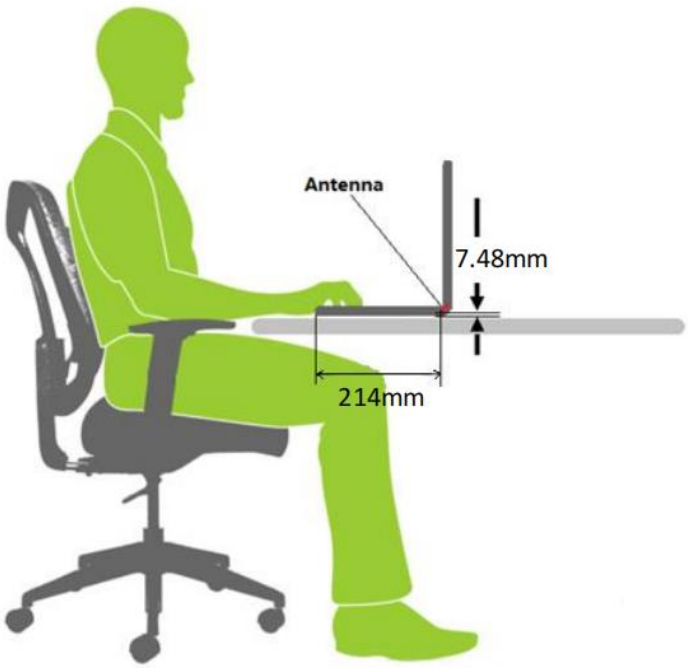
Band (GHz)	Mode	Channel	Freq. (MHz)	Conducted Power (dBm)	Tune-up Power Limit (dBm)	SAR Test Require.
6 (5.925~7.125)	802.11a	1	5955	6.36	8.00	No
		45	6175	6.47	8.00	No
		93	6415	6.10	8.00	No
		97	6435	6.94	8.00	No
		105	6475	6.87	8.00	No
		113	6515	6.55	8.00	No
		117	6535	6.96	8.00	No
		153	6715	6.49	8.00	No
		181	6855	7.12	8.00	No
		185	6875	6.71	8.00	No
		213	7015	7.58	8.00	No
		233	7115	7.31	8.00	No
	802.11ax20	1	5955	1.02	2.00	No
		45	6175	1.28	2.00	No
		93	6415	1.41	2.00	No
		97	6435	1.93	3.00	No
		105	6475	1.92	3.00	No
		113	6515	1.72	3.00	No
		117	6535	0.78	1.00	No
		153	6715	1.06	2.00	No
		181	6855	0.98	2.00	No
		185	6875	1.92	3.00	No
		213	7015	1.63	2.00	No
		233	7115	2.42	3.00	No
	802.11ax40	3	5965	2.37	3.00	No
		43	6165	3.27	4.00	No
		91	6405	3.15	4.00	No
		99	6445	3.47	4.00	No
		107	6485	3.70	5.00	No
		115	6525	3.49	4.00	No
		123	6565	3.70	4.00	No
		155	6725	3.03	4.00	No
		179	6845	3.34	4.00	No
		187	6885	3.80	4.00	No
		211	7005	4.41	5.00	No
		227	7085	3.81	4.00	No
	802.11ax80	7	5985	6.28	7.00	No
		39	6145	6.68	8.00	No
		87	6385	6.39	7.00	No

		103	6465	6.73	8.00	No
		119	6545	7.09	8.00	No
		135	6625	7.03	8.00	No
		151	6705	6.13	7.00	No
		167	6785	5.94	7.00	No
		183	6865	6.18	7.00	No
		199	6945	6.68	8.00	No
		215	7025	7.75	9.00	No
	802.11ax160	15	6025	12.21	13.00	Yes
		47	6185	12.09	13.00	No
		79	6345	**12.47**	13.00	Yes
		111	6505	12.40	13.00	Yes
		143	6665	11.78	13.00	Yes
		175	6825	12.33	13.00	No
		207	6985	12.41	13.00	Yes
	RU-26/0	1	5955	-7.48	-7.00	No
	RU-26/8	93	6415	-7.09	-6.00	No
	RU-26/0	97	6435	-7.57	-7.00	No
	RU-26/0	117	6535	-7.22	-6.00	No
	RU-26/8	181	6855	-7.52	-7.00	No
	RU-26/8	233	7115	-8.58	-8.00	No
	RU-52/40	233	7115	-6.08	-5.00	No
	RU-106/53	1	5955	-1.48	-1.00	No
	RU-106/54	93	6415	-1.09	0.00	No
	RU-106/53	97	6435	-2.07	-1.00	No
	RU-106/53	117	6535	-1.72	-1.00	No
	RU-106/54	181	6855	-2.52	-2.00	No
	RU-106/54	233	7115	-4.08	-3.00	No

8 ANTENNA LOCATION

8.1 Laptop Mode antenna location sketch





9 TEST RESULT OF POWER DENSITY

General Note:

1. The reported PD is the measured Total PD value adjusted for maximum tune-up tolerance and duty cycle factor.
   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 PD testing of WLAN signal with non-100% duty cycle, the measured PD is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)".
2. The most conservative test distance of 2mm was applied to PD measurement.
3. Power density was calculated by repeated E-field measurements on two measurement planes separated by $\lambda/4$.
4. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools.
5. Per FCC guidance and equipment manufacturer guidance, power density results were scaled according to IEC 62479:2010 for the portion of the measurement uncertainty > 30%. Total expanded uncertainty of 2.66 dB (84.5%) was used to determine the psPD measurement scaling factor.
6. According to TCBC workshop in October 2018 that 4cm^2 averaging area may now be considered.

9.1 WIFI 6GHz

Antenna manufacturer	Mode	Antenna	Test Position	Position	Dist. (mm)	Ch.	Freq. (MHz)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty Factor	Meas. uncertainty Scaling Factor	Meas Modulation psPD [W/m2]	Scaled Modulation psPD [W/m2]	PD Meas. No.
Body																
LUXSHARE-ICT	802.11ax160	Main	Laptop	Bottom Side	0	111	6505	12.61	13.00	1.094	86.00	1.163	1.554	2.130	4.211	/
					0	15	6025	12.43	13.00	1.140	86.00	1.163	1.554	1.340	2.761	/
					0	79	6345	12.20	13.00	1.202	86.00	1.163	1.554	1.650	3.584	/
					0	143	6665	11.85	13.00	1.303	86.00	1.163	1.554	1.700	4.003	/
					0	207	6985	12.04	13.00	1.247	86.00	1.163	1.554	2.560	**5.769**	1#
Amphenol	802.11ax160	Main	Laptop	Bottom Side	0	111	6505	12.61	13.00	1.094	86.00	1.163	1.554	1.860	3.678	/
LUXSHARE-ICT	802.11ax160	Aux.	Laptop	Bottom Side	0	79	6345	12.47	13.00	1.130	86.00	1.163	1.554	1.050	2.144	/
					0	15	6025	12.21	13.00	1.199	86.00	1.163	1.554	0.784	1.699	/
					0	111	6505	12.40	13.00	1.148	86.00	1.163	1.554	1.240	2.573	/
					0	143	6665	11.78	13.00	1.324	86.00	1.163	1.554	1.610	**3.853**	2#
					0	207	6985	12.41	13.00	1.146	86.00	1.163	1.554	1.550	3.210	/
Amphenol	802.11ax160	Aux.	Laptop	Bottom Side	0	79	6345	12.47	13.00	1.130	86.00	1.163	1.554	1.030	2.104	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.																

10 SIMULTANEOUS TRANSMISSION

The fields generated by the antennas can be correlated or uncorrelated. At different frequencies, fields are always uncorrelated, and the aggregate power density contributions can be summed according to spatially averaged values of corresponding sources at any point in space, r, to determine the total exposure ratio (TER). Assuming I sources, the TER at each point in space is equal to

$$TER^{uncorr}(r) = \sum_{i=1}^{I} ER_i = \sum_{i=1}^{I} \frac{S_{av,i}(r, f_i)}{S_{lim}(f_i)}$$

Where Sav,i is the power density for the source I operating at a frequency fi and Slim is the power density limit as specified by the relevant standard.
Exposure from transmitters operating above and below 6GHz, where 6GHz denotes the transmission frequency where the basic restrictions change from being defined in terms of SAR to being defined in terms of power density, therefore uncorrelated and the TER is determined as

$$TER^{uncorr}(r) = \sum_{i=1}^{I} ER_i = \sum_{i=1}^{I} \frac{S_{av,i}(r, f_i)}{S_{lim}(f_i)}$$

According to the FCC guidance in TCBC workshop and IEC TR 63170, the total exposure ratio calculated by taking ratio of maximum reported SAR divided by SAR limit and adding it to maximum measured power density by its limit. Numerical sum of the ratios should be less or equal to 1. Therefore the simultaneous transmission should be follows:

$$TER = \sum_{n=1}^{N} \frac{SAR_n}{SAR_{n,limit}} + \sum_{n=1}^{N} \frac{S_{m,avg}}{S_{m,limit}} < 1$$

10.1 Simultaneous Transmission Mode Considerations

NO.	Mode	6G WLAN & Bluetooth
		Body
1	6 G WLAN (Main Antenna)	+ 6 G WLAN (Auxiliary Antenna)
2	6 G WLAN (Main Antenna)	+ Bluetooth (Auxiliary Antenna)
3	6 G WLAN (Auxiliary Antenna)	+ Bluetooth (Auxiliary Antenna)
4	6 G WLAN (Main Antenna)	+ 6 G WLAN (Auxiliary Antenna) + Bluetooth (Auxiliary Antenna)

Note:

1. The Auxiliary Antenna supports TX/RX function for WLAN and Bluetooth, and the Main Antenna supports TX/RX function for WLAN.
2. 2.4G WLAN or 5G WLAN and 6G WLAN does not support transmission together.
3. The maximum SAR of Bluetooth refers to the SAR report BL-SZ2260135-701.

10.2 RF Exposure Simultaneous Transmission Evaluation

10.2.1 Highest Bluetooth and WLAN Body Power Density Simultaneous Transmission

Test Mode	Position	Mode	Power Density		1g SAR		Total Exposure Ratio
			(W/m2)	Limt	(W/kg)	Limt	
Laptop	Bottom Side	6G WLAN (Main Antenna)	5.769	10	/	/	0.585
		Bluetooth (Auxiliary Antenna)	/	/	0.013	1.60	
		6G WLAN (Auxiliary Antenna)	3.853	10	/	/	0.393
		Bluetooth (Auxiliary Antenna)	/	/	0.013	1.60	
		6G WLAN (Main Antenna)	5.769	10	/	/	**0.970**
		6G WLAN (Auxiliary Antenna)	3.853	10	/	/	
		Bluetooth (Auxiliary Antenna)	/	/	0.013	1.60	

Note: The maximum SAR of Bluetooth refers to the SAR report BL-SZ2260135-701.

11 TEST EQUIPMENTS LIST

Description	Manufacturer	Model	Serial No./Version	Cal. Date	Cal. Due
PC	Dell	N/A	N/A	N/A	N/A
Test Software	Speag	cDASY6 mmWave	V2.4.2.62	N/A	N/A
Verification Source	Speag	10GHz	SN: 2010	2022/06/28	2023/06/27
EUmmW Probe	Speag	EX3DV4	SN: 9607	2022/02/04	2023/02/04
Data Acquisition Electronics	Speag	DAE4	SN: 878	2022/06/13	2023/06/12
Signal Generator	R&S	SMB100A	177746	2022/05/19	2023/05/18
Power Meter	R&S	NRVD-B2	7250BJ-0112/2011	2021/09/08	2022/09/07
Power Sensor	R&S	NRV-Z4	100381	2021/09/08	2022/09/07
Power Sensor	R&S	NRV-Z2	100211	2021/09/08	2022/09/07
Thermometer	Elitech	RC-4HC	N/A	2021/09/22	2022/09/21
Power Amplifier	mini-circuits	ZVA-183W-S+	932502132	N/A	N/A

ANNEX A SIMULATING LIQUID VERIFICATION RESULT

The system was verified to be within ±0.66 dB of the power density targets on the calibration certificate according to the test system specification in the users manual and calibration facility recommendation.

Date	Freq. (GHz)	Meas. Forward Power (dBm)	Measured PD 4 cm^2 (W/m^2)	Normalized PD 4 cm^2 (W/m^2)	Target Forward PD 4 cm^2 (W/m^2)	Deviation (dB)
2022.07.28	10	18.82	72.9	145.5	148	-0.08
Note1: The tolerance limit of System validation ±0.66dB.						
Note2: According the verification source 10GHz calibration report the target forward power is 21.82dBm.						
Note3: Normalized PD 4 cm^2= Measured PD 4 cm^2 *10^(0.1*(Target Forward power- Meas. Forward Power))						

System Performance Check Data (10GHz)

Measurement Report for Device Device Under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
Device,	100.0 x 100.0 x 8.0		5G Verification Source

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Frequency [MHz]	Conversion Factor
5G	FRONT, 10.00	10000.0	1.0

Hardware Setup

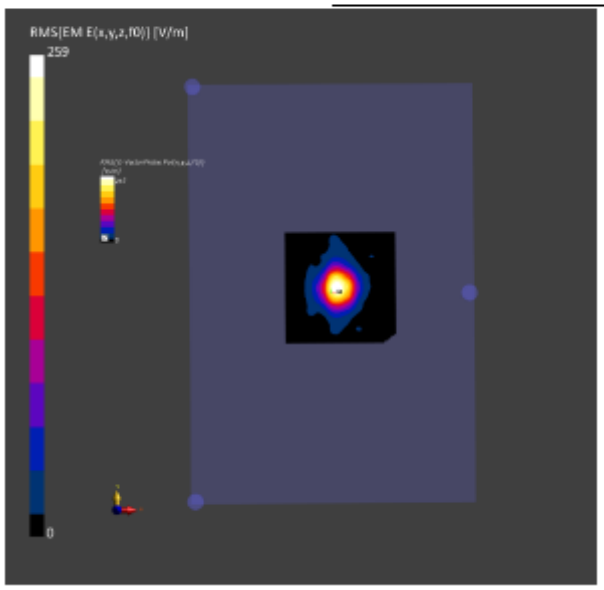
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave - xxxx	Air -	EUmmWV4 - SN9607_F1-55GHz, 2022-02-04	DAE4 Sn878, 2022-06-13

Scans Setup

Scan Type	5G Scan
Grid Extents [mm]	120.0 x 120.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	10.0

Measurement Results

Date	2022-07-28
Avg. Area [cm^2]	4.00
psPDn+ [W/m^2]	71.8
psPDtot+ [W/m^2]	72.9
H_{max} [A/m]	0.542
E_{max} [V/m]	198
$max_{(Stot)}$ [W/m^2]	95.1
Power Drift [dB]	0.06



ANNEX B POWER DENDITY TEST DATA

Meas.1 Measurement Report for Device

Device Under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
ThinkBook 14p G3 ARH	312.0 x 215.0 x 12.0		Laptop

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Frequency [MHz]	Conversion Factor
5G	Bottom of Laptop, 2.00	6985.0	1.0

Hardware Setup

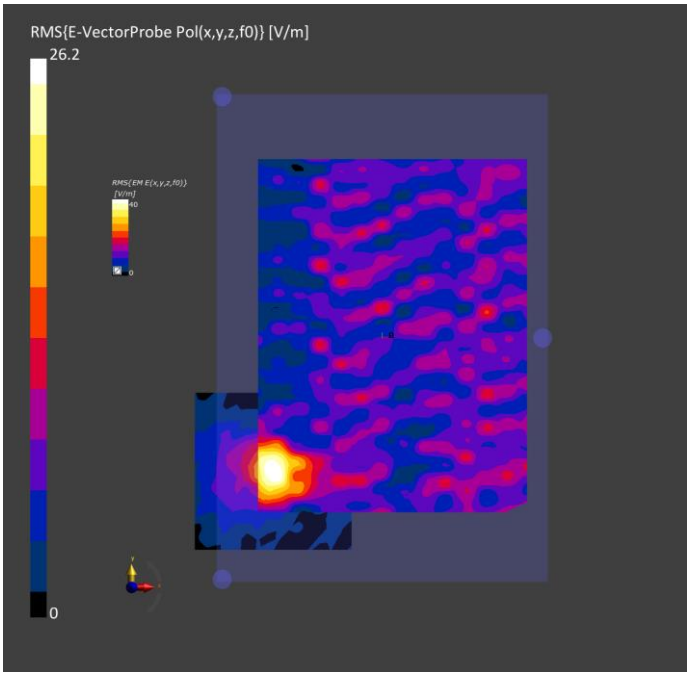
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave - xxxx	Air -	EUmmWV4 - SN9607_F1-55GHz, 2022-02-04	DAE4 Sn878, 2022-06-13

Scans Setup

Scan Type	5G Scan
Grid Extents [mm]	25.0 x 25.0
Grid Steps [lambda]	0.250 x 0.250
Sensor Surface [mm]	2.0

Measurement Results

Date	2022-07-28
Avg. Area [cm^2]	4.00
psPDn+ [W/m^2]	2.22
psPDtot+ [W/m^2]	2.56
Hmax [A/m]	0.102
Emax [V/m]	40.0
max(Stot) [W/m^2]	3.23
iPDn	4.50
Power Drift [dB]	0.06



Meas.2 Measurement Report for Device

Device Under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
ThinkBook 14p G3 ARH	312.0 x 215.0 x 12.0		Laptop

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Frequency [MHz]	Conversion Factor
5G	Bottom of Laptop, 2.00	6665.0	1.0

Hardware Setup

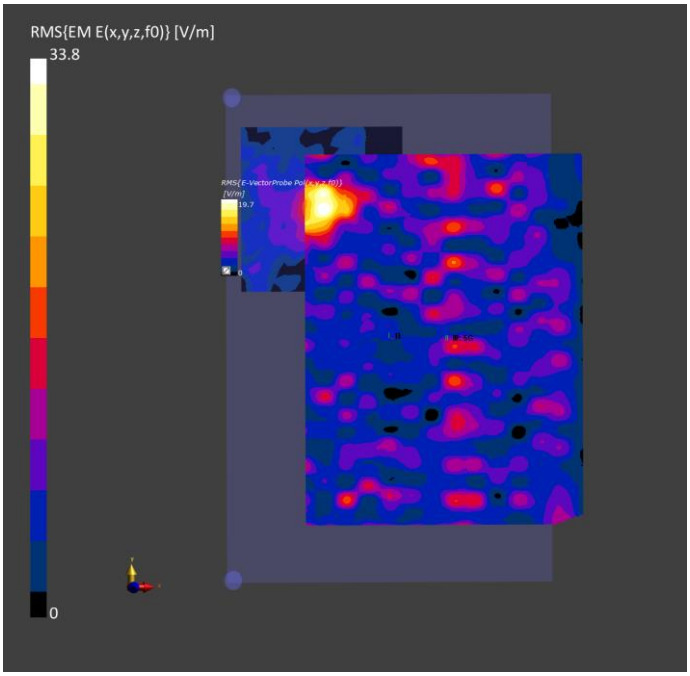
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave - xxxx	Air -	EUmmWV4 - SN9607_F1-55GHz, 2022-02-04	DAE4 Sn878, 2022-06-13

Scans Setup

Scan Type	5G Scan
Grid Extents [mm]	25.0 x 25.0
Grid Steps [lambda]	0.250 x 0.250
Sensor Surface [mm]	2.0

Measurement Results

Date	2022-07-28
Avg. Area [cm^2]	4.00
psPDn+ [W/m^2]	1.25
psPDtot+ [W/m^2]	1.61
Hmax [A/m]	0.075
Emax [V/m]	33.8
max(Stot) [W/m^2]	2.22
iPDn	2.53
Power Drift [dB]	0.08



ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2260135-AW.pdf”.

ANNEX D POWER DENSITY TEST SETUP PHOTOS

Please refer the document “BL-SZ2260135-AS-3.pdf”.

ANNEX E POWER DENSITY CALIBRATION REPORT

Please refer the document “CALIBRATION REPORT-3.pdf”.

Statement

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