Certificate Number: 5055.02

TEST REPORT
FOR SAR TESTING

Report No.: SRTC2021-9004(F)-21041902(H)

Product Name: Notebook Computer

Product Model: Legion 7 16ACHg6

Applicant: MEDIATEK Inc.

Maximum SAR: Body (1g): 0.490 W/kg

Limb (1g): 0.490 W/kg

Test Conclusion: Pass

Specification: Part 2.1093

IEEE Std 1528

KDB Procedures

FCC ID: RAS-MT7921

The State Radio_monitoring_center Testing Center (SRTC)

15th Building, No.30 Shixing Street, Shijingshan District, Beijing, P.R.China

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1 GENERAL INFORMATION

1.1 Notes of the test report

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The test results relate only to individual items of the samples which have been tested.
The certification and accreditation identifiers used in this report shall not be applicable to the tested or calibrated samples thereof. The manufacturer shall not mark the tested samples or items (or a separate part of the item) with the identifiers of certification and accreditation to mislead relevant parties about the tested samples or items.

1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Address:	15th Building, No.30 Shixing Street, Shijingshan District, Beijing P.R.China
City:	Beijing
Country or Region:	P.R.China
Contacted person:	Liu Jia
Tel:	+86 10 57996183
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Email:	liujiaf@srtc.org.cn
Registration number:	239125

1.3 Applicant's details

Company:	MEDIATEK Inc.
Address:	No. 1, Dusing 1st Rd., Hsinchu Science Park Hsinchu City 30078 Taiwan

1.4 Test Environment

Date of Receipt of test sample at SRTC:	2021.04.19	
Testing Start Date:	2021.04.20	
Testing End Date:	2021.04.23	
Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	22	35

2 DESCRIPTION OF THE EQUIPMENT UNDER TEST

2.1 Final equipment build status

Wireless Technology and Frequency Bands	☒Bluetooth Band: 2.4GHz~2.4835GHz ☒Wi-Fi Band: 2.4GHz~2.4835GHz 5.15GHz~5.35GHz(UNII-1&2A) 5.47GHz~5.725GHz(UNII-2C) 5.725GHz~5.85GHz(UNII-3)
Mode	Wi-Fi ☒802.11a ☒802.11b ☒802.11g ☒802.11n (20MHz) ☒802.11n (40MHz) ☒802.11ac(20MHz) ☒802.11ac(40MHz) ☒802.11ac(80MHz) ☐802.11ac(160MHz) ☒802.11ax(20MHz) ☒802.11ax(40MHz) ☒802.11ax(80MHz) ☐802.11ax(160MHz) Bluetooth ☒BR(GFSK) ☒EDR(π/4 DQPSK , 8-DPSK) ☒BLE(GFSK)
Note	For WLAN, Duty cycle could be changed up to 99%. Adapter “MT7921” supported 11ax mode – allow transmitting in full channel bandwidth. (Resource unit & Specific Resource unit do not take into account in this report)

2.2 Support equipment

The following support equipment was used to exercise the EUT during testing:

H/W Version	1
S/W Version	1
Series model name	Legion 7 16ACHg6****** (* can be 0-9, a-z, A-Z, any symbol, blank or nothing)
SN	Sample1:HY76081D007 Sample2:HY76081D008
Antenna	Supplier1: Speed Wireless Technical Co., LTD.(WLAN) Supplier2: SAA (WLAN) Further information about antenna is mentioned in chapter “SAR Test result”
Adapter	WLAN:MT7921
Notes	There are two antenna suppliers for this model, we choose each antenna with highest gain to perform SAR measurement for each frequency band.

WLAN Antenna information			
Vendor	Type	Antenna Part number (Main)	Antenna Part number (Aux)
SAA	PIFA	DC33001TH00	DC33001TH10
Speed Wireless Technical Co., LTD.	PIFA	DC33001TG00	DC33001TG10

3 REFERENCE SPECIFICATION

Specification	Version	Title
Part 2.1093	2020	Radio frequency radiation exposure evaluation: portable devices.
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
KDB 447498 D01	v06	General RF Exposure Guidance
KDB 248227 D01	v02r02	SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS
KDB 865664 D01	v01r04	SAR Measurement from 100 MHz to 6 GHz
KDB 865664 D02	v01r02	RF Exposure Reporting
KDB 616217 D04	v01r02	SAR for laptop and tablets

4 TEST CONDITIONS

4.1 Picture to demonstrate the required liquid depth

The liquid depth is large than 15cm in the used Flat phantoms in flat section, and the depth of the tissue simulant was 15.0 ± 0.5 cm measured from the ear reference point during system checking and device measurements.

Liquid depth for SAR Measurement

4.2 Test signal, frequencies and output power

The device was put into operation by using a call tester. Communication between the device and the call tester was established by air link.
The device output power was set to maximum power level for all tests; a fully charged battery was used for every test sequence.
In all operating bands the measurements were performed on lowest, middle and highest channels.

4.3 SAR measurement set-up

The system is based on a high precision robot (working range greater than 0.9m), which positions the probes with a positional repeatability of better than ± 0.02mm. Special E-probe have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length =300mm) to the data acquisition unit. A cell controller system contains the power supply, robot controller, teaches pendant (Joystick), and remote control, is used to drive the

robot motors.
The PC consists of the Micron Pentium IV computer with Win7 system and SAR Measurement Software DASY5 Professional, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot.
A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The 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 PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines.
The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection
The robot uses its own controller with a built in VME-bus computer.

4.4 Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528.
System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.
The SPEAG device holder was used to position the device in all tests whilst a tripod was used to position the validation dipoles against the flat section of phantom.

4.5 Tissue simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEEE 1528. All tests were carried out using simulants whose dielectric parameters were within ± 10% below 3GHz and ± 5% above 3GHz of the recommended values when use DASY system according to KDB865664D01. All tests were carried out within 24 hours of measuring the dielectric parameters.
The following tissue stimulants were used for Head and Body test:

Tissue Stimulant Recipes	
Name	Broadband tissue-equivalent liquid
Type	HBBL600-10000V6 Simulating Liquid
Note: The stimulant could be the same for head and body.	

4.6 Description of the test procedure

4.6.1 Device Holder

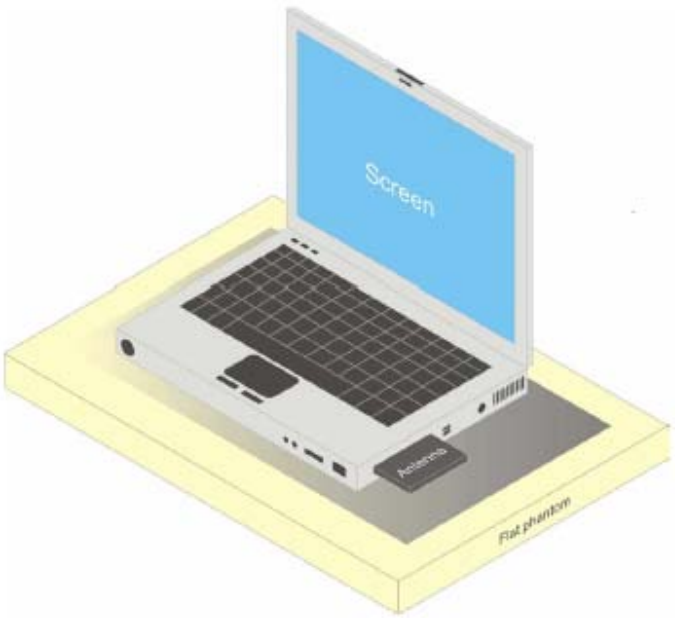
The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the Dasy52 system.

	
Device Holder 1 for Mobile phone	Device Holder 2 for Laptop and Tablet

Device holder supplied by SPEAG

4.6.2 Test positions

According to 248227 D01 and user manual intended use, The screen portion of the device shall be in an open **position at a 90°angle** as seen in Figure, the device shall tested **directly against** the flat phantom.



4.6.3 Scan Procedure

First, area scans were used for determination of the field distribution and the approximate location of the local peak SAR values. The SAR distribution is scanned along the inside surface, at least for an area larger than the projection of the handset and antenna. The angle between the probe axis and the surface normal line is recommended but not required to be less than 30°. The SAR distribution is first measured on a 2-D coarse grid. The scan region should cover all areas that are exposed and encompassed by the projection of the handset. There are 15 mm × 15 mm (equal or less than 2GHz), 12 mm × 12 mm (from 2GHz~4GHz) and 10mm x 10mm (from 4GHz~6GHz) measurement grid used when two staggered one-dimensional cubic splines are used to estimate the maximum SAR location. When the reported 1g-SAR estimated by area scan is less than 1.40 w/kg.

Zoom scan was performed by using the configuration mentioned below or more conservative scan area and step to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.

Below 3GHz：32mmX32mmX30mm scan area with 8 mm X8 mm X5 mm steps

2GHz-3GHz：32mmX32mmX30mm scan area with 8 mm X8 mm X5 mm steps

3GHz-4GHz：28mmX28mmX28mm scan area with 7 mm X7 mm X4 mm steps

4GHz-5GHz： 25mmX25mmX24mm scan area with 5 mm X5 mm X3 mm steps

5GHz-6GHz： 25mmX25mmX22mm scan area with 5 mm X5 mm X2 mm steps

4.6.4 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.

The interpolation, extrapolation and maximum search routines within Dasy5 are all based on the modified Quadratic Shepard’s method (Robert J. Renka, “Multivariate Interpolation Of Large Sets Of Scattered Data”, University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).

The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neigh boring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.

In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

5 RESULT SUMMARY

The maximum measured SAR values for Body-supported configuration is given as follows. The device conforms to the requirements of the standard(s) when the maximum measured SAR value is less than or equal to the limit.

Standalone Transmission:

Exposure Position	Frequency Band	Max Reported SAR Results (W/kg)/1g	Highest Reported SAR Result (W/kg)/1g	Limit (W/kg)/1g	Result
Body (0mm)	BT/BLE	0.490	0.490	1.6	PASS
	WLAN 2.4GHz	0.386			
	WLAN 5GHz U-NII-1	0.490			
	WLAN 5GHz U-NII-2A	0.474			
	WLAN 5GHz U-NII-2C	0.391			
	WLAN 5GHz U-NII-3	0.463			

Simultaneous Transmission:

Exposure Position	Mode	Highest Reported SAR Result (W/kg)/1g	Limit (W/kg)/1g	Result
Body (0mm)	WLAN 5GHz + BLE	0.980	1.6	PASS

This Test Report Is proved by: Mr. Peng Zhen 	Checked by: Ms. Liu Jia 
Tested and issued by: Mr. Li Bin 	Approved date: 20210427

6 TEST RESULTS

6.1 WLAN/BT/BLE Conducted power and Tune up tolerance

MT7921 wireless network adapter:

WLAN 2.4GHz

Mode	Freq. (MHz)	Average power output (dBm)			Tune-up		
		Main	Aux	MIMO	Main	Aux	MIMO
802.11b	2412	19.17	18.54	21.88	20.0	19.0	22.5
	2437	**19.42**	**18.95**	22.20	20.0	19.0	22.5
	2462	19.26	18.76	22.03	20.0	19.0	22.5
802.11g	2412	17.01	17.08	20.06	18.0	18.0	21.0
	2437	17.93	17.86	20.91	18.0	18.0	21.0
	2462	16.95	16.82	19.90	18.0	18.0	21.0
802.11ac20	2412	16.38	16.25	19.33	18.0	18.0	21.0
	2437	17.68	17.54	20.62	18.0	18.0	21.0
	2462	16.07	16.01	19.05	18.0	18.0	21.0
802.11ac40	2422	14.92	15.28	18.11	16.5	16.5	19.5
	2437	16.02	15.99	19.02	16.5	16.5	19.5
	2452	15.93	14.92	18.46	16.5	16.5	19.5
802.11ax20	2412	16.83	16.81	19.83	18.5	18.5	21.5
	2437	18.12	18.10	21.12	18.5	18.5	21.5
	2462	16.55	16.49	19.53	18.5	18.5	21.5
802.11ax40	2422	15.31	15.30	18.32	16.5	16.5	19.5
	2437	16.35	16.25	19.31	16.5	16.5	19.5
	2452	15.23	15.09	18.17	16.5	16.5	19.5

WLAN 5GHz U-NII-1

Mode	Freq. (MHz)	Average power output (dBm)			Tune-up		
		Main	Aux	MIMO	Main	Aux	MIMO
802.11a	5180	15.52	15.13	18.34	16.0	16.0	19.0
	5200	17.21	17.00	20.12	18.0	18.0	21.0
	5240	**18.82**	**18.65**	21.75	19.0	19.0	22.0
802.11ac20	5180	16.01	15.48	18.76	17.0	17.0	20.0
	5200	17.12	16.78	19.96	18.0	18.0	21.0
	5240	18.13	18.03	21.09	19.0	19.0	22.0
802.11ac40	5190	15.19	14.85	18.03	16.0	16.0	19.0
	5230	17.56	17.12	20.36	18.0	18.0	21.0
802.11ac80	5210	13.99	13.61	16.81	15.0	15.0	18.0
802.11ax20	5180	16.18	15.79	19.00	17.0	17.0	20.0
	5200	17.36	17.03	20.21	18.0	18.0	21.0
	5240	18.28	18.22	21.26	19.0	19.0	22.0
802.11ax40	5190	15.48	15.13	18.32	16.0	16.0	19.0
	5230	17.68	17.29	20.50	18.0	18.0	21.0
802.11ax80	5210	14.22	13.87	17.06	15.0	15.0	18.0

WLAN 5GHz U-NII-2A

Mode	Freq. (MHz)	Average power output (dBm)			Tune-up		
		Main	Aux	MIMO	Main	Aux	MIMO
802.11a	5260	**18.82**	**18.74**	21.79	19.0	19.0	22.0
	5300	18.76	18.46	21.62	19.0	19.0	22.0
	5320	15.68	15.58	18.64	16.0	16.0	19.0
802.11ac20	5260	18.36	18.33	21.36	19.0	19.0	22.0
	5300	17.88	17.52	20.71	18.0	18.0	21.0
	5320	15.51	15.39	18.46	16.0	16.0	19.0
802.11ac40	5270	17.78	17.39	20.60	18.0	18.0	21.0
	5310	15.12	14.82	17.98	16.0	16.0	19.0
802.11ac80	5290	14.00	13.58	16.81	15.0	15.0	18.0
802.11ax20	5260	18.69	18.47	21.59	19.0	19.0	22.0
	5300	18.02	17.77	20.91	19.0	19.0	22.0
	5320	15.74	15.65	18.71	16.0	16.0	19.0
802.11ax40	5270	17.99	17.65	20.83	18.0	18.0	21.0
	5310	15.41	15.19	18.31	16.0	16.0	19.0
802.11ax80	5290	14.35	14.16	17.27	15.0	15.0	18.0

WLAN 5GHz U-NII-2C

Mode	Freq. (MHz)	Average power output (dBm)			Tune-up		
		Main	Aux	MIMO	Main	Aux	MIMO
802.11a	5500	16.92	16.23	19.60	17.0	17.0	20.0
	5580	**18.73**	**18.51**	21.63	19.0	19.0	22.0
	5700	17.51	17.46	20.50	18.0	18.0	21.0
	5720	16.64	16.74	19.70	17.0	17.0	20.0
802.11ac20	5500	16.77	16.29	19.55	17.0	17.0	20.0
	5580	18.38	18.23	21.32	19.0	19.0	22.0
	5700	17.50	16.83	20.19	18.0	18.0	21.0
	5720	13.19	11.68	15.51	14.0	14.0	17.0
802.11ac40	5510	16.78	16.07	19.45	17.0	17.0	20.0
	5550	16.99	16.45	19.74	17.0	17.0	20.0
	5670	17.08	17.19	20.15	18.0	18.0	21.0
	5710	10.09	8.99	12.59	11.0	11.0	14.0
802.11ac80	5530	14.96	14.02	17.53	15.0	15.0	18.0
	5610	16.20	15.84	19.03	17.0	17.0	20.0
	5690	14.55	13.99	17.29	15.0	15.0	18.0
802.11ax20	5500	16.98	16.16	19.60	17.0	17.0	20.0
	5580	18.77	18.64	21.72	19.0	19.0	22.0
	5700	17.81	17.15	20.50	18.0	18.0	21.0
	5720	13.40	11.95	15.75	14.0	14.0	17.0
802.11ax40	5510	17.00	16.47	19.75	18.0	18.0	21.0
	5550	17.48	16.97	20.24	18.0	18.0	21.0
	5670	17.41	17.17	20.30	18.0	18.0	21.0
	5710	10.49	9.05	12.84	11.0	11.0	14.0
802.11ax80	5530	15.25	14.55	17.92	16.0	16.0	19.0
	5610	16.58	16.45	19.53	17.0	17.0	20.0
	5690	13.60	12.79	16.22	14.0	14.0	17.0

WLAN 5GHz U-NII-3

Mode	Freq. (MHz)	Average power output(dBm)			Tune-up		
		Chain	Aux	MIMO	Main	Aux	MIMO
802.11a	5745	19.53	19.53	22.54	20.0	20.0	23.0
	5785	19.65	19.68	22.68	20.0	20.0	23.0
	5825	**19.85**	**19.41**	22.65	20.0	20.0	23.0
802.11n20	5745	18.39	18.07	21.24	19.0	19.0	22.0
	5785	18.32	18.01	21.18	19.0	19.0	22.0
	5825	18.45	18.03	21.26	19.0	19.0	22.0
802.11n40	5755	17.30	16.95	20.14	18.0	18.0	21.0
	5795	17.03	17.16	20.11	18.0	18.0	21.0
802.11ac80	5775	16.16	15.78	18.98	17.0	17.0	20.0
802.11ax20	5745	18.65	17.97	21.33	19.0	19.0	22.0
	5785	18.50	18.43	21.48	19.0	19.0	22.0
	5825	19.59	18.01	21.88	20.0	20.0	23.0
802.11ax40	5755	17.44	17.42	20.44	18.0	18.0	21.0
	5795	17.51	17.17	20.35	18.0	18.0	21.0
802.11ax80	5775	16.24	16.22	19.24	17.0	17.0	20.0

BT (Aux)

Modulation type	Average Power Output (dBm)			Tune-up
	2402MHz	2441MHz	2480MHz	
GFSK	11.25	**11.28**	11.21	12.0
π/4DQPSK	8.05	8.17	8.13	9.0
8DPSK	8.08	8.22	8.16	9.0

BLE (Aux)

Modulation type	Average Power Output (dBm)			Tune-up
	2402MHz	2440MHz	2480MHz	
GFSK (LE 1Mbps)	11.20	**11.25**	11.17	12.0
GFSK (LE 2Mbps)	11.27	11.34	11.25	12.0

6.2 System Checking

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250mW (except for frequency above 5GHz use 10mW) was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system checking results (dielectric parameters and SAR values) are given in the table below.

Freq(MHz)	SAR measured (normalized to 1W)		Target (Ref.Value)	Delta (%)	Tolerance (%)	Verdict
D2450V2	1g	54.6	53.0	3.0	±10	Pass
D5GHzV2 (5200MHz)	1g	76.0	75.9	0.1	±10	Pass
D5GHzV2 (5300MHz)	1g	77.0	78.0	-1.3	±10	Pass
D5GHzV2 (5600MHz)	1g	81.0	80.0	1.3	±10	Pass

Plots of the system checking scans are given in Appendix A.

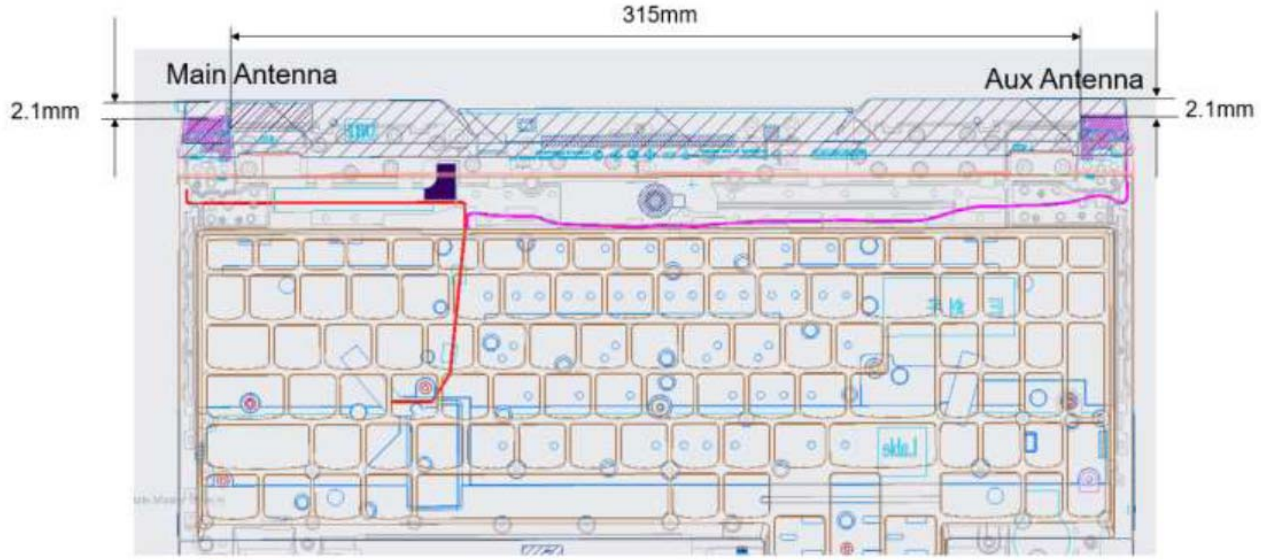
For the measurement of the following parameters the SPEAG DAKS-3.5 dielectric parameter probe is used, representing the open-ended coaxial probe measurement procedure.

Freq.(MHz)	Liquid parameters	measured	Target	Delta (%)	Tolerance (%)	Verdict
2450	εr	39.05	39.20	-0.4	±5	Pass
	σ[S/m]	1.77	1.80	-1.7	±5	Pass
5200	εr	35.98	36.00	-0.1	±5	Pass
	σ[S/m]	4.62	4.66	-0.9	±5	Pass
5300	εr	35.79	35.90	-0.3	±5	Pass
	σ[S/m]	4.72	4.76	-0.8	±5	Pass
5600	εr	35.25	35.50	-0.7	±5	Pass
	σ[S/m]	5.02	5.07	-1.0	±5	Pass

6.3 SAR Test results

In order to determine the largest value of the peak spatial-average SAR of a handset, all device positions, configurations, and operational modes should be tested for each frequency band according to Steps 1 to 3 below.
Step 1: The tests should be performed at the channel that is closest to the center of the transmit frequency band.
a) All device positions (cheek and tilt, for both left and right sides of the SAM phantom),
b) All configurations for each device position in a), e.g., antenna extended and retracted, and
c) All operational modes for each device position in item a) and configuration in item b) in each frequency band, e.g., analog and digital, If more than three frequencies need to be tested (i.e., Nc > 3), then all frequencies, configurations and modes shall be tested for all of the above test conditions.
Step 2: For the condition providing the highest peak spatial-average SAR determined in Step 1 for each frequency, perform all tests at all other test frequency channels, e.g., lowest and highest frequencies. In addition, for all other conditions (device position, configuration, and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies should be tested as well.
Step 3: Examine all data to determine the largest value of the peak.
Note:
1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
Scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
Duty Factor = 1 / Duty Cycle(%)
For cellular network:
Reported SAR (W/kg) = Measured SAR (W/kg) * Scaling Factor
For WLAN
Reported SAR (W/kg) = Measured SAR (W/kg) * Scaling Factor*Duty factor
2. Per KDB 447498 D01v06, for each exposure position, if the highest output channel reported SAR ≤0.8W/kg, other channels SAR testing are not necessary.
3. The distance between the EUT and the phantom bottom is 0mm.

Antenna location of the notebook



SAR Strategy

There are 2 antenna suppliers for this model, and customer provides 2 laptops with different antennas, SRTC change WLAN adapters when necessary.

Unlicensed network

WLAN/BT/BLE antenna gain				
Supplier	2.4GHz	5.2&5.3GHz	5.6GHz	5.8GHz
	2400-2500MHz	5150-5350MHz	5470-5725MHz	5725-5850MHz
SAA Main Antenna (dBi)	3.11	3.51	4.54	4.68
SAA Aux Antenna (dBi)	2.47	2.68	1.55	1.23
Speed Main Antenna (dBi)	1.40	1.85	2.69	1.71
Speed Aux Antenna (dBi)	2.81	2.58	1.83	1.56

Frequency band	Main Antenna	Aux Antenna
BT/BLE	N/A	Speed
WLAN 2.4GHz	SAA	Speed
WLAN 5.2GHz(UNII-1&2A)	SAA	SAA
WLAN 5.5GHz(UNII-2C)	SAA	Speed
WLAN 5.5GHz(UNII-3)	SAA	Speed

Antenna gains across one frequency band are the same, we choose antenna with highest gain which are in color red for each band, and we perform SAR test in channel which with highest conducted power in color yellow when necessary.

Note1: For the power of combined MIMO=chain A + chain B, when the power level is similar to single chain, we do not need to consider because that's not the worst case.
Note2: 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.

SRTC verified the laptop with and without charger in normal user condition. And the laptop with charger is the worst case, so all the results are listed below under the condition of laptop with charger.

Standalone Transmission:

Test case						Meas. power (dBm)	Tune-up (dBm)	Scaling factor	Duty factor	Meas. SAR (W/kg)/1g	Reported SAR (W/kg)/1g
WLAN Card +ANT	Mode	Antenna	Exposure condition	Position	Freq. (MHz)						
MT7921 +SAA	2.4GHz 802.11b	Main	Body support	Bottom	2437	19.42	20.0	1.14	1.01	0.334	0.386
	5GHz U-NII-1 802.11a	Main			5230	14.96	15.0	1.01	1.01	0.225	0.229
	5GHz U-NII-2A 802.11a	Main			5260	14.86	15.0	1.03	1.01	0.218	0.227
	5GHz U-NII-2C 802.11a	Main			5580	18.73	19.0	1.06	1.01	0.364	0.391
	5GHz U-NII-3 802.11a	Main			5825	19.85	20.0	1.04	1.01	0.443	0.463
	5GHz U-NII-1 802.11a	Aux			5230	14.79	15.0	1.05	1.01	0.223	0.236
MT7921 +Speed	2.4GHz 802.11b	Aux			2437	18.95	19.0	1.01	1.01	0.281	0.287
	5GHz U-NII-2A 802.11a	Aux			5260	14.72	15.0	1.07	1.01	0.198	0.213
	5GHz U-NII-2C 802.11a	Aux			5580	18.51	19.0	1.12	1.01	0.217	0.245
	5GHz U-NII-3 802.11a	Aux			5785	19.41	20.0	1.15	1.01	0.187	0.216
	BT GFSK	Aux			2441	11.28	12.0	1.14	1.01	0.334	0.386
	BLE GFSK (LE 1Mbps)	Aux			2440	11.25	12.0	1.04	1.01	0.465	0.490

Simultaneous Transmission SAR Analysis:

First antenna	Secondary antenna	Scenarios
WLAN Main (2.4GHz/5GHz) ANT	WLAN Aux (2.4GHz/5GHz)/BT/BLE ANT	WLAN main(2.4GHz)+WLAN aux(2.4GHz)
		WLAN main(2.4GHz)+WLAN aux(5GHz)
		WLAN main(5GHz)+WLAN aux(2.4GHz)
		WLAN main(5GHz)+WLAN aux(5GHz)
		WLAN main(2.4GHz)+BT
		WLAN main(5GHz)+BT
		WLAN main(2.4GHz)+BLE
		WLAN main(5GHz)+BLE

1. CCK modulation (802.11b) support DD mode which could transmit with 2 antennas at same time.
2. Based on OFDM modulation, 802.11a/b/n/ac/ax support CDD or MIMO could transmit with 2 antennas at same time.
3. WLAN 2.4GHz and WLAN 5GHz can work at same time.
4. When different technologies share the same antenna (ex: secondary antenna), even 5GHz WLAN and BT cannottransmit together.

Mode	Simultaneous Transmission worst case
	Reported SAR (W/kg)/1g
Main ANT WLAN	0.490
AUX ANT WLAN/BT/BLE	0.490
Sum	0.980
Description	5GHz U-NII-1 + BLE

7 MEASUREMENT UNCERTAINTY

(0.3 - 3 GHz range)								
Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.0 %	N	1	1	1	±6.0 %	±6.0 %	∞
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	0.7	0.7	±1.9 %	±1.9 %	∞
Hemispherical Isotropy	±9.6 %	R	$\sqrt{3}$	0.7	0.7	±3.9 %	±3.9 %	∞
Boundary Effects	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Linearity	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %	∞
System Detection Limits	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Modulation Response^m	±2.4 %	R	$\sqrt{3}$	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
Response Time	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Integration Time	±2.6 %	R	$\sqrt{3}$	1	1	±1.5 %	±1.5 %	∞
RF Ambient Noise	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
RF Ambient Reflections	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Probe Positioner	±0.4 %	R	$\sqrt{3}$	1	1	±0.2 %	±0.2 %	∞
Probe Positioning	±2.9 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Max. SAR Eval.	±2.0 %	R	$\sqrt{3}$	1	1	±1.2 %	±1.2 %	∞
Test Sample Related								
Device Positioning	±2.9 %	N	1	1	1	±2.9 %	±2.9 %	145
Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
Power Drift	±5.0 %	R	$\sqrt{3}$	1	1	±2.9 %	±2.9 %	∞
Power Scaling^p	±0 %	R	$\sqrt{3}$	1	1	±0.0 %	±0.0 %	∞
Phantom and Setup								
Phantom Uncertainty	±6.1 %	R	$\sqrt{3}$	1	1	±3.5 %	±3.5 %	∞
SAR correction	±1.9 %	R	$\sqrt{3}$	1	0.84	±1.1 %	±0.9 %	∞
Liquid Conductivity (mea.)^{DAK}	±2.5 %	R	$\sqrt{3}$	0.78	0.71	±1.1 %	±1.0 %	∞
Liquid Permittivity (mea.)^{DAK}	±2.5 %	R	$\sqrt{3}$	0.26	0.26	±0.3 %	±0.4 %	∞
Temp. unc. - Conductivity^{BB}	±3.4 %	R	$\sqrt{3}$	0.78	0.71	±1.5 %	±1.4 %	∞
Temp. unc. - Permittivity^{BB}	±0.4 %	R	$\sqrt{3}$	0.23	0.26	±0.1 %	±0.1 %	∞
Combined Std. Uncertainty						±11.2 %	±11.1 %	361
Expanded STD Uncertainty						**±22.3 %**	**±22.2 %**	

(3 - 6 GHz range)								
Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.55 %	N	1	1	1	±6.55 %	±6.55 %	∞
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	0.7	0.7	±1.9 %	±1.9 %	∞
Hemispherical Isotropy	±9.6 %	R	$\sqrt{3}$	0.7	0.7	±3.9 %	±3.9 %	∞
Boundary Effects	±2.0 %	R	$\sqrt{3}$	1	1	±1.2 %	±1.2 %	∞
Linearity	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %	∞
System Detection Limits	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Modulation Response^m	±2.4 %	R	$\sqrt{3}$	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
Response Time	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Integration Time	±2.6 %	R	$\sqrt{3}$	1	1	±1.5 %	±1.5 %	∞
RF Ambient Noise	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
RF Ambient Reflections	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Probe Positioner	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Probe Positioning	±6.7 %	R	$\sqrt{3}$	1	1	±3.9 %	±3.9 %	∞
Max. SAR Eval.	±4.0 %	R	$\sqrt{3}$	1	1	±2.3 %	±2.3 %	∞
Test Sample Related								
Device Positioning	±2.9 %	N	1	1	1	±2.9 %	±2.9 %	145
Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
Power Drift	±5.0 %	R	$\sqrt{3}$	1	1	±2.9 %	±2.9 %	∞
Power Scaling^p	±0 %	R	$\sqrt{3}$	1	1	±0.0 %	±0.0 %	∞
Phantom and Setup								
Phantom Uncertainty	±6.6 %	R	$\sqrt{3}$	1	1	±3.8 %	±3.8 %	∞
SAR correction	±1.9 %	R	$\sqrt{3}$	1	0.84	±1.1 %	±0.9 %	∞
Liquid Conductivity (mea.)^{DAK}	±2.5 %	R	$\sqrt{3}$	0.78	0.71	±1.1 %	±1.0 %	∞
Liquid Permittivity (mea.) ^{DAK}	±2.5 %	R	$\sqrt{3}$	0.26	0.26	±0.3 %	±0.4 %	∞
Temp. unc. - Conductivity ^{BB}	±3.4 %	R	$\sqrt{3}$	0.78	0.71	±1.5 %	±1.4 %	∞
Temp. unc. - Permittivity ^{BB}	±0.4 %	R	$\sqrt{3}$	0.23	0.26	±0.1 %	±0.1 %	∞
Combined Std. Uncertainty						±12.3 %	±12.2 %	748
Expanded STD Uncertainty						**±24.6 %**	**±24.5 %**	

8 TEST EQUIPMENTS

The measurements were performed using an automated near-field scanning system, DASY5, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements was the 'advanced extrapolation' algorithm.

The following table lists calibration dates of SPEAG components:

Test Equipment	Model	Serial Number	Calibration date	Calibration due data
DAE	DAE4	720	2020.09.30	2021.09.29
DAE	DAE4	546	2020.08.13	2021.08.12
Dosimetric E-field Probe	ES3DV3	3127	2020.09.01	2021.08.31
Dosimetric E-field Probe	EX3DV4	3708	2020.10.30	2021.10.29
Dipole Validation Kit	D450V2	1024	2020.10.26	2023.10.25
Dipole Validation Kit	D750V3	1101	2020.10.16	2023.10.15
Dipole Validation Kit	D835V2	4d023	2020.10.16	2023.10.15
Dipole Validation Kit	D900V2	171	2020.09.17	2023.09.16
Dipole Validation Kit	D1450V2	1065	2020.10.16	2023.10.15
Dipole Validation Kit	D1800V2	2d084	2020.09.18	2023.09.17
Dipole Validation Kit	D2000V2	1009	2020.10.14	2023.10.13
Dipole Validation Kit	D2450V2	738	2020.10.13	2023.10.12
Dipole Validation Kit	D2600V2	1166	2019.11.08	2022.11.07
Dipole Validation Kit	D3300V2	1014	2019.11.11	2022.11.10
Dipole Validation Kit	D3500V2	1090	2019.11.11	2022.11.10
Dipole Validation Kit	D3700V2	1058	2019.11.11	2022.11.10
Dipole Validation Kit	D3900V2	1033	2019.11.11	2022.11.10
Dipole Validation Kit	D4200V2	1013	2019.11.12	2022.11.11
Dipole Validation Kit	D4600V2	1033	2019.11.12	2022.11.11
Dipole Validation Kit	D4900V2	1025	2019.11.12	2022.11.11
Dipole Validation Kit	D5GHzV2	1079	2020.10.10	2023.10.09

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration date	Calibration Due data
Signal Generator	E4428C	MY45280865	2020.08.20	2021.08.19
Signal Generator	SML 03	103514	2020.08.20	2021.08.19
Power meter	E4417A	MY45101182	2020.08.20	2021.08.19
Power Sensor	E4412A	MY41502214	2020.08.20	2021.08.19
Power Sensor	E4412A	MY41502130	2020.08.20	2021.08.19
Power meter	E4417A	MY45101004	2020.08.20	2021.08.19
Power Sensor	E9300B	MY41496001	2020.08.20	2021.08.19
Power Sensor	E9300B	MY41496003	2020.08.20	2021.08.19
Communication Tester	E5515C	MY48367401	2020.08.20	2021.08.19
Communication Tester	CMW500	161702	2020.08.20	2021.08.19
Communication Tester	MT8820C	6201300660	2020.08.20	2021.08.19
Communication Tester	MT8821C	6201547819	2020.08.20	2021.08.19
Vector Network Analyzer	VNA R140	0011213	2020.09.18	2021.09.17
Dielectric Parameter Probe	DAKS-3.5	1042	2020.09.17	2021.09.16

Dipole

SAR target

Refers to system check, measured SAR (1g and 10g) deviates from the Target SAR value of calibration report within 10%.

Impedance and Return loss measured by Network analyzer

The most recent measurement of the real or imaginary parts of the impedance deviates within 5 Ω from the previous measurement. (Data from the last calibration report)

The most recent return-loss result deviates within 20% from the previous measurement. (Data from the last calibration report)

Dipole450 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	59.1Ω+0.06jΩ	55.5Ω+6.40jΩ
Return loss	-21.6 dB	-21.9 dB

Dipole750 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	53.8Ω-4.02jΩ	53.7Ω-1.63jΩ
Return loss	-25.5 dB	-28.2dB

Dipole835 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	54.5Ω-6.16jΩ	52.6Ω-2.37jΩ
Return loss	-34.1 dB	-29.3dB

Dipole900 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	53.0Ω-5.24jΩ	49.1Ω-6.69jΩ
Return loss	-23.2 dB	-23.4dB

Dipole1450 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	54.7Ω+3.95jΩ	52.4Ω-1.35jΩ
Return loss	-33.1 dB	-31.5dB

Dipole1800 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	44.2Ω+5.06jΩ	48.9Ω-2.71jΩ
Return loss	-31.8 dB	-30.6dB

Dipole2000 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.9Ω-3.37jΩ	49.4Ω-2.46jΩ
Return loss	-28.4 dB	-31.9dB

Dipole2450 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	53.2Ω-9.98jΩ	53.3Ω+6.38jΩ
Return loss	-19.9 dB	-23.1dB

Dipole2600 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	50.4Ω+6.71jΩ	47.9Ω-7.80jΩ
Return loss	-23.5 dB	-21.7dB

Dipole3500 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	53.3Ω-10.48jΩ	52.6Ω+3.5jΩ
Return loss	-29.5 dB	-27.4dB

Dipole3700 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	46.0Ω+6.99jΩ	48.3Ω+1.1jΩ
Return loss	-34.5 dB	-33.6dB

Dipole3900 TSL Parameters (3900MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.8Ω-11.48jΩ	48.3Ω-4.9jΩ
Return loss	-28.7 dB	-25.6dB

Dipole3900 TSL Parameters (4100MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.6Ω+9.70jΩ	59.0Ω-0.8jΩ
Return loss	-17.1 dB	-21.6dB

Dipole4200 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	43.9Ω+1.52jΩ	48.3Ω+1.10jΩ
Return loss	-33.5 dB	-33.6dB

Dipole4600 TSL Parameters (4500MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	46.0Ω-1.14jΩ	46.4Ω-4.5jΩ
Return loss	-27.2 dB	-24.5dB

Dipole4600 TSL Parameters (4600MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	49.0Ω-7.87jΩ	51.8Ω-6.35jΩ
Return loss	-20.7 dB	-23.8dB

Dipole4600 TSL Parameters (4700MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	55.0Ω+0.91jΩ	55.9Ω-3.20jΩ
Return loss	-26.2 dB	-24.0dB

Dipole4900 TSL Parameters		
Parameters	Measured data	Target (Ref. Value)
Impedance	45.8Ω-1.40jΩ	50.6Ω-5.2jΩ
Return loss	-26.7 dB	-25.7dB

Dipole5GHz TSL Parameters (5200MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.2Ω+13.89jΩ	50.2Ω-10.0jΩ
Return loss	-17.0 dB	-20.0dB

Dipole5GHz TSL Parameters (5300MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	52.0Ω-11.40jΩ	47.2Ω-7.33jΩ
Return loss	-18.4 dB	-21.9dB

Dipole5GHz TSL Parameters (5500MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.6Ω+6.61jΩ	52.0Ω-7.96jΩ
Return loss	-18.6 dB	-21.9dB

Dipole5GHz TSL Parameters (5600MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	53.6Ω+7.31jΩ	55.7Ω-3.78jΩ
Return loss	-22.1 dB	-23.8dB

Dipole5GHz TSL Parameters (5800MHz)		
Parameters	Measured data	Target (Ref. Value)
Impedance	51.6Ω-5.96jΩ	53.7Ω-5.87jΩ
Return loss	-19.0 dB	-23.5dB

Detailed information of Isotropic E-field Probe Type ES3DV3

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Dynamic Range	5 μW/g to > 100 W/kg; Linearity: ± 0.2 dB
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones

Detailed information of Isotropic E-field Probe Type EX3DV4

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Optical Surface Detection	± 0.3 mm repeatability in air and clear liquids over diffuse reflecting surfaces
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
Dynamic Range	10 μW/g to > 100 W/kg Linearity: ± 0.2 dB (noise: typically< 1 μW/g)
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

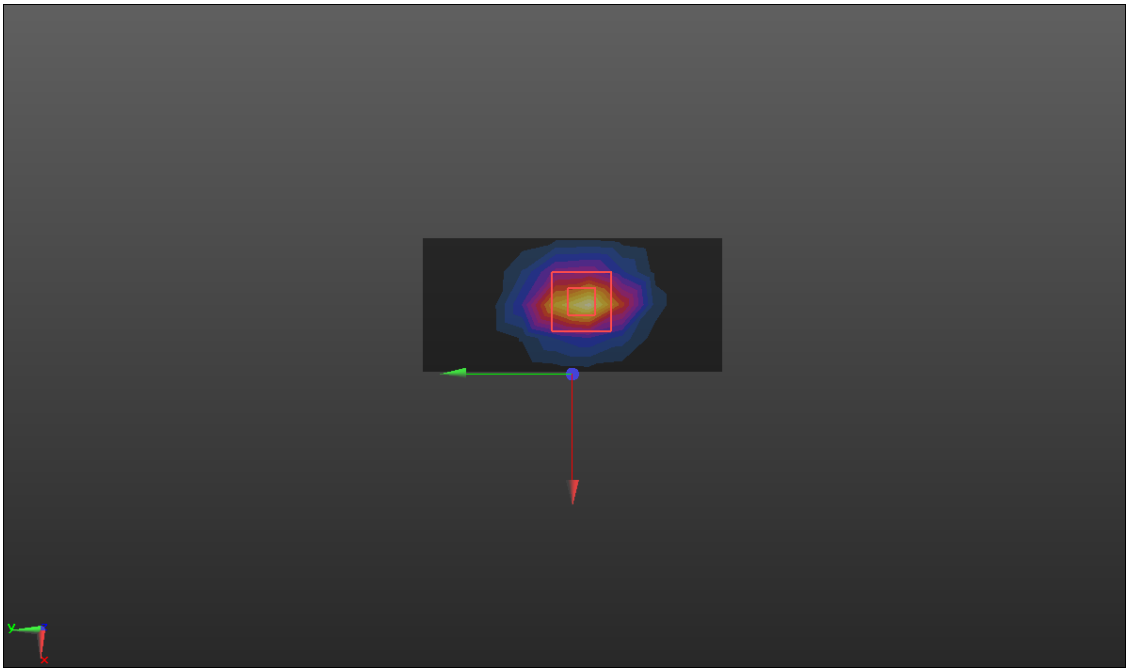
ANNEX A – TEST PLOTS

System check	2450MHz

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty cycle:1:1
Medium parameters used: f = 2450 MHz; σ = 1.77 S/m; ε_r = 39.05; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3708; ConvF(7.48, 7.48, 7.48); Calibrated: 2020/10/30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection),
- Electronics: DAE4 Sn546; Calibrated: 11/11/2020
- Phantom: ELI V4.0 (20deg probe tilt); Type: QD OVA 001 Bx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483) **System Performance Check at Frequencies 2450 MHz/2450/Area Scan (8x11x1):** Measurement grid: dx=12mm, dy=12mm
  Maximum value of SAR (measured) = 21.5 W/kg
  System Performance Check at Frequencies 2450 MHz/2450/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
  Reference Value = 109.2 V/m; Power Drift = 0.02 dB
  Peak SAR (extrapolated) = 28.5 W/kg
  SAR(1 g) = 13.65 W/kg; SAR(10 g) = 6.33 W/kg
  Maximum value of SAR (measured) = 23.0 W/kg



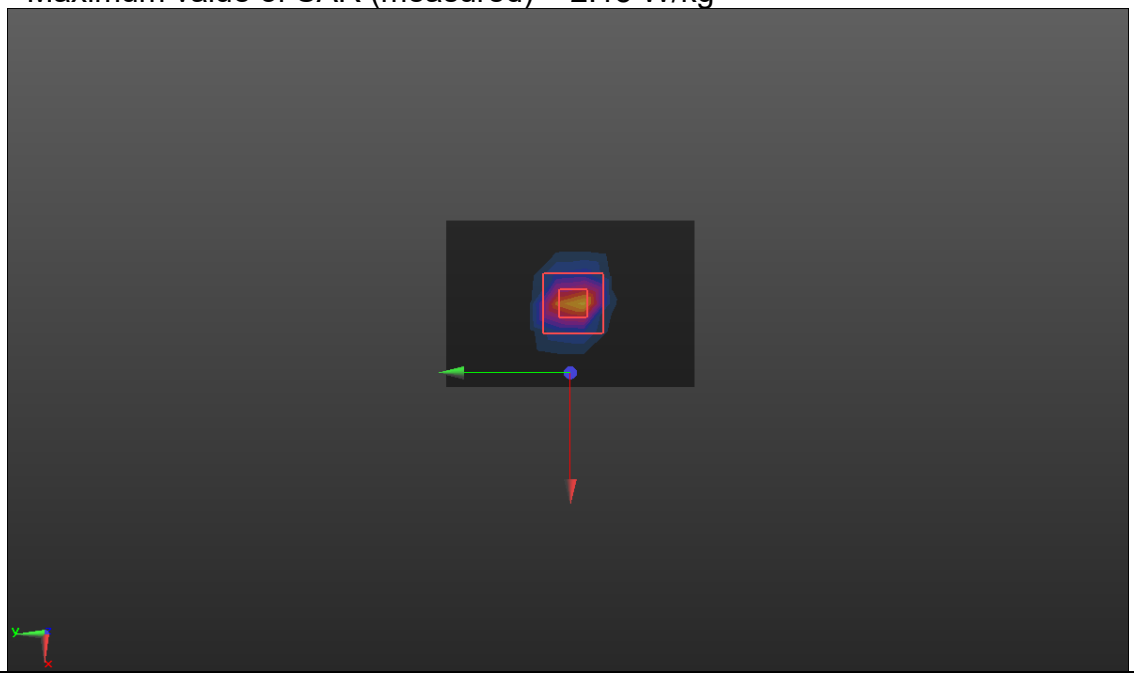
SRTC performed system check by using 250mW at antenna port

System check	5200MHz

Communication System: UID 0, CW (0); Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 4.62 S/m; ε_r = 35.98; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3708; ConvF(5.57, 5.57, 5.57) @ 5200 MHz; Calibrated: 10/30/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn546; Calibrated: 11/11/2020
- Phantom: ELI V4.0 (20deg probe tilt); Type: QD OVA 001 Bx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)
  SYSTEM CHECK 5200MHz/Area Scan (6x7x1): Measurement grid: dx=10mm, dy=10mm
  Maximum value of SAR (measured) = 1.91 W/kg
  SYSTEM CHECK 5200MHz/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
  Reference Value = 11.30 V/m; Power Drift = 0.02 dB
  Peak SAR (extrapolated) = 3.34 W/kg
  SAR(1 g) = 0.76 W/kg; SAR(10 g) = 0.22 W/kg
  Maximum value of SAR (measured) = 2.15 W/kg



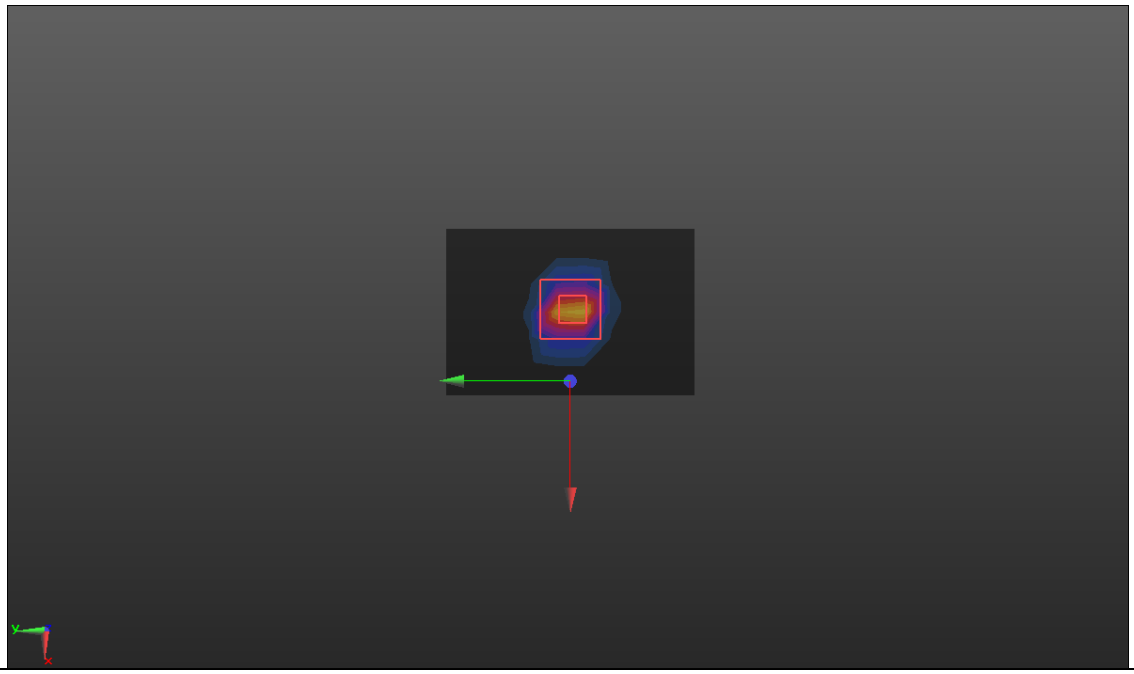
SRTC performed system check by using 10mW at antenna port

System check	5300MHz

Communication System: UID 0, CW (0); Frequency: 5300 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5300 MHz; σ = 4.72 S/m; ε_r = 35.79; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3708; ConvF(5.43, 5.43, 5.43) @ 5300 MHz; Calibrated: 10/30/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn546; Calibrated: 11/11/2020
- Phantom: ELI V4.0 (20deg probe tilt); Type: QD OVA 001 Bx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)
  SYSTEM CHECK 5300MHz/Area Scan (6x7x1): Measurement grid: dx=10mm, dy=10mm
  Maximum value of SAR (measured) = 1.73 W/kg
  SYSTEM CHECK 5300MHz/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
  Reference Value = 10.51 V/m; Power Drift = 0.01 dB
  Peak SAR (extrapolated) = 3.72 W/kg
  SAR(1 g) = 0.77 W/kg; SAR(10 g) = 0.22 W/kg
  Maximum value of SAR (measured) = 2.20 W/kg



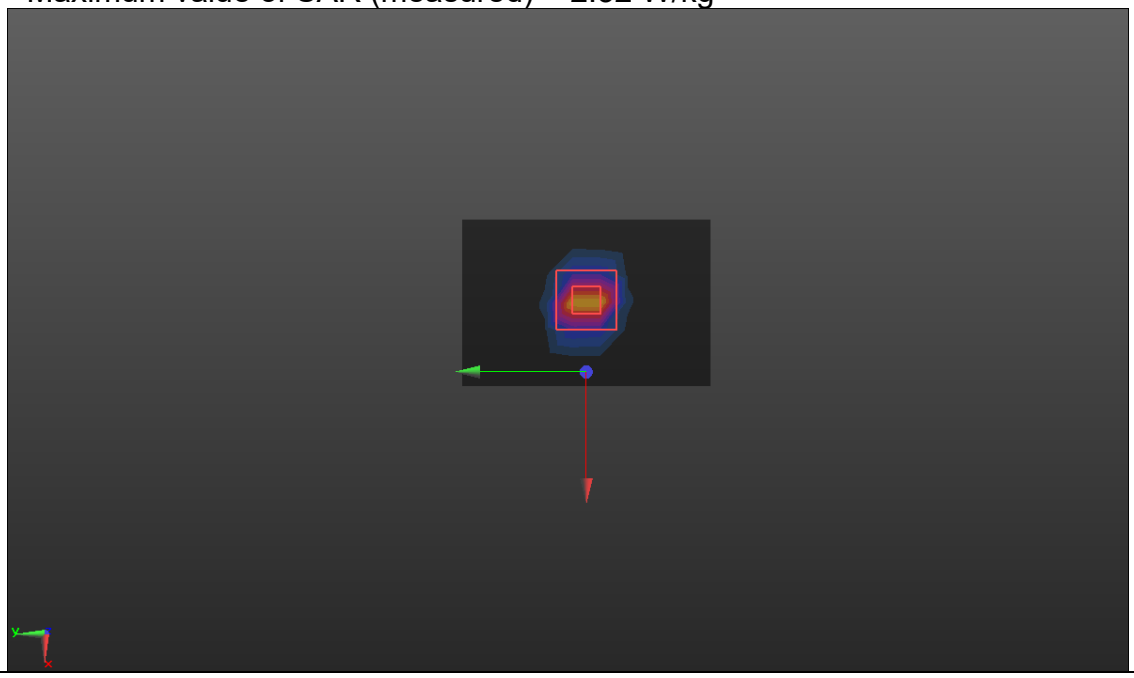
SRTC performed system check by using 10mW at antenna port

System check	5600MHz

Communication System: UID 0, CW (0); Frequency: 5600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.02 S/m; ε_r = 35.25; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3708; ConvF(4.95, 4.95, 4.95) @ 5600 MHz; Calibrated: 10/30/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn546; Calibrated: 11/11/2020
- Phantom: ELI V4.0 (20deg probe tilt); Type: QD OVA 001 Bx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)
  SYSTEM CHECK 5600MHz /Area Scan (6x7x1): Measurement grid: dx=10mm, dy=10mm
  Maximum value of SAR (measured) = 1.76 W/kg
  SYSTEM CHECK 5600MHz /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
  Reference Value = 12.20 V/m; Power Drift = 0.03 dB
  Peak SAR (extrapolated) = 3.95 W/kg
  SAR(1 g) = 0.81 W/kg; SAR(10 g) = 0.23 W/kg
  Maximum value of SAR (measured) = 2.32 W/kg



SRTC performed system check by using 10mW at antenna port

WIFI 2.4GHz Ant Main

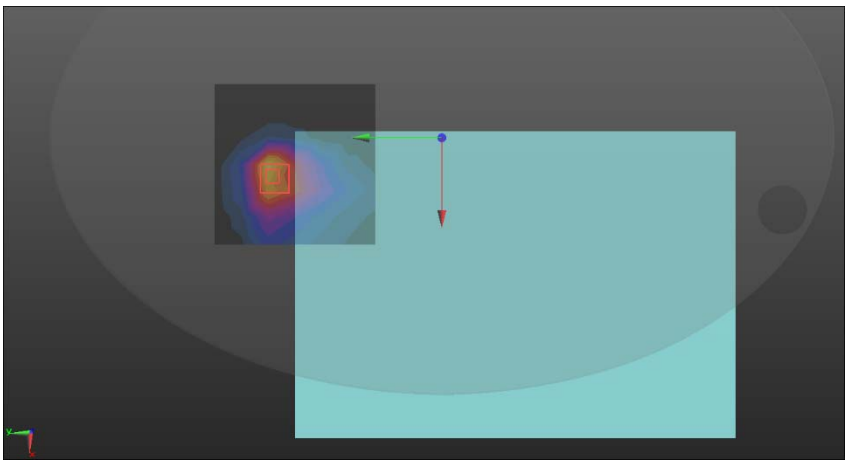
Body-Supported	Bottom

Communication System: UID 10415 - AAA, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle); Frequency: 2437 MHz;Duty Cycle: 1:1.4243
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.788 S/m; ε_r = 39.219; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3708; ConvF(7.48, 7.48, 7.48) @ 2437 MHz; Calibrated: 10/30/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn546; Calibrated: 11/11/2020
- Phantom: ELI V4.0 (20deg probe tilt); Type: QD OVA 001 Bx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Main ANT/WLAN 2.4GHz Main ANT/Area Scan (7x7x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 0.480 W/kg
Main ANT/WLAN 2.4GHz Main ANT/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.632 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.583 W/kg
SAR(1 g) = 0.334 W/kg; SAR(10 g) = 0.154 W/kg
Smallest distance from peaks to all points 3 dB below = 13.7 mm
Ratio of SAR at M2 to SAR at M1 = 50.1%



WIFI 5GHz U-NII-1 Ant Main

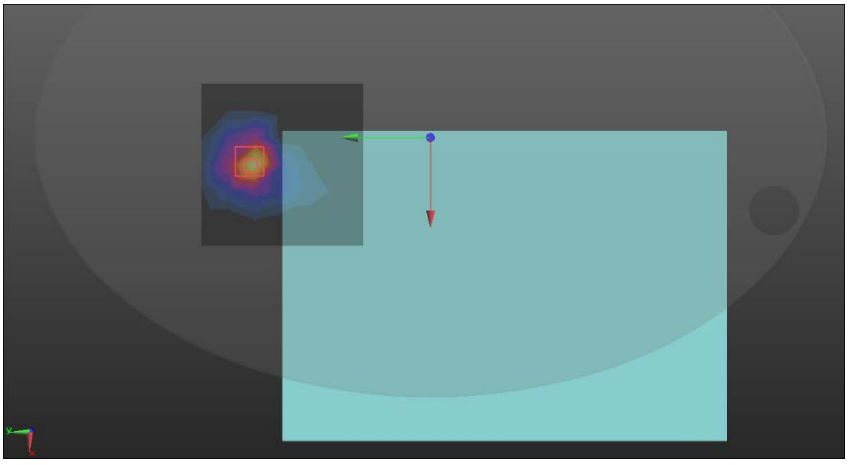
Body-Supported	Bottom

Communication System: UID 10317 - AAD, IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle); Frequency: 5240 MHz;Duty Cycle: 1:6.85962
Medium parameters used (interpolated): f = 5240 MHz; σ = 4.701 S/m; ε_r = 35.96; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3708; ConvF(5.57, 5.57, 5.57) @ 5240 MHz; Calibrated: 10/30/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn546; Calibrated: 11/11/2020
- Phantom: ELI V4.0 (20deg probe tilt); Type: QD OVA 001 Bx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Main ANT/WLAN 5GHz U-NII-1 Main ANT/Area Scan (7x7x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 0.661 W/kg
Main ANT/WLAN 5GHz U-NII-1 Main ANT/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.225 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.585 W/kg
SAR(1 g) = 0.465 W/kg; SAR(10 g) = 0.146 W/kg
Smallest distance from peaks to all points 3 dB below = 11.6 mm
Ratio of SAR at M2 to SAR at M1 = 17.3%



WIFI 5GHz U-NII-2A Ant Main

Body-Supported	Bottom

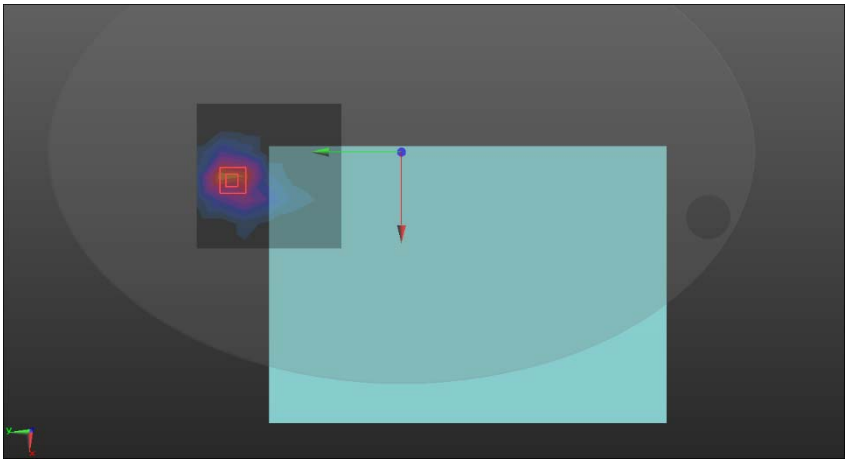
Communication System: UID 10317 - AAD, IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle); Frequency: 5260 MHz;Duty Cycle: 1:6.85962
Medium parameters used (interpolated): f = 5260 MHz; σ = 4.721 S/m; ε_r = 35.94; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3708; ConvF(5.43, 5.43, 5.43) @ 5260 MHz; Calibrated: 10/30/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn546; Calibrated: 11/11/2020
- Phantom: ELI V4.0 (20deg probe tilt); Type: QD OVA 001 Bx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Main ANT/WLAN 5GHz U-NII-2A Main ANT/Area Scan (7x7x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 0.634 W/kg

Main ANT/WLAN 5GHz U-NII-2A Main ANT/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.112 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.430 W/kg
SAR(1 g) = 0.450 W/kg; SAR(10 g) = 0.160 W/kg
Smallest distance from peaks to all points 3 dB below = 12.9 mm
Ratio of SAR at M2 to SAR at M1 = 19.5%



WIFI 5GHz U-NII-2C Ant Main

Body-Supported	Bottom

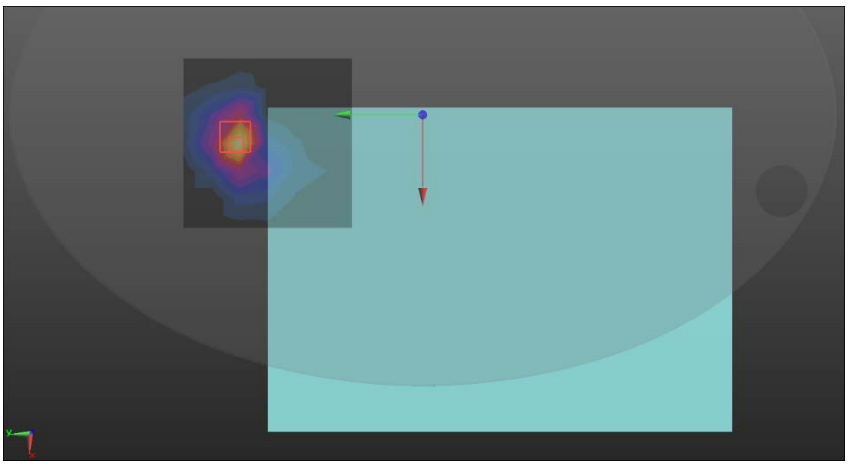
Communication System: UID 10317 - AAD, IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle); Frequency: 5580 MHz;Duty Cycle: 1:6.85962
Medium parameters used (interpolated): f = 5580 MHz; σ = 5.049 S/m; ε_r = 35.526; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3708; ConvF(4.95, 4.95, 4.95) @ 5580 MHz; Calibrated: 10/30/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn546; Calibrated: 11/11/2020
- Phantom: ELI V4.0 (20deg probe tilt); Type: QD OVA 001 Bx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Main ANT/WLAN 5GHz U-NII-2C Main ANT/Area Scan (7x7x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 0.500 W/kg

Main ANT/WLAN 5GHz U-NII-2C Main ANT/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.588 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.705 W/kg
SAR(1 g) = 0.364 W/kg; SAR(10 g) = 0.134 W/kg
Smallest distance from peaks to all points 3 dB below = 11.6 mm
Ratio of SAR at M2 to SAR at M1 = 14.2%



WIFI 5GHz U-NII-3 Ant Main

Body-Supported	Bottom

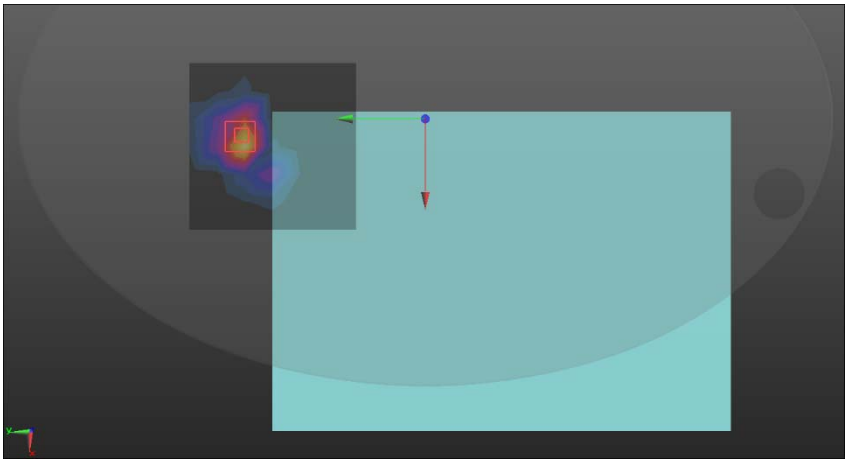
Communication System: UID 10317 - AAD, IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle); Frequency: 5825 MHz;Duty Cycle: 1:6.85962
Medium parameters used (interpolated): f = 5825 MHz; σ = 5.296 S/m; ε_r = 35.275; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3708; ConvF(5.12, 5.12, 5.12) @ 5825 MHz; Calibrated: 10/30/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn546; Calibrated: 11/11/2020
- Phantom: ELI V4.0 (20deg probe tilt); Type: QD OVA 001 Bx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Main ANT/WLAN 5GHz U-NII-3 Main ANT/Area Scan (7x7x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 0.572 W/kg

Main ANT/WLAN 5GHz U-NII-3 Main ANT/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.962 W/kg
SAR(1 g) = 0.443 W/kg; SAR(10 g) = 0.147 W/kg
Smallest distance from peaks to all points 3 dB below = 10.1 mm
Ratio of SAR at M2 to SAR at M1 = 15.2%



BLE Ant Aux

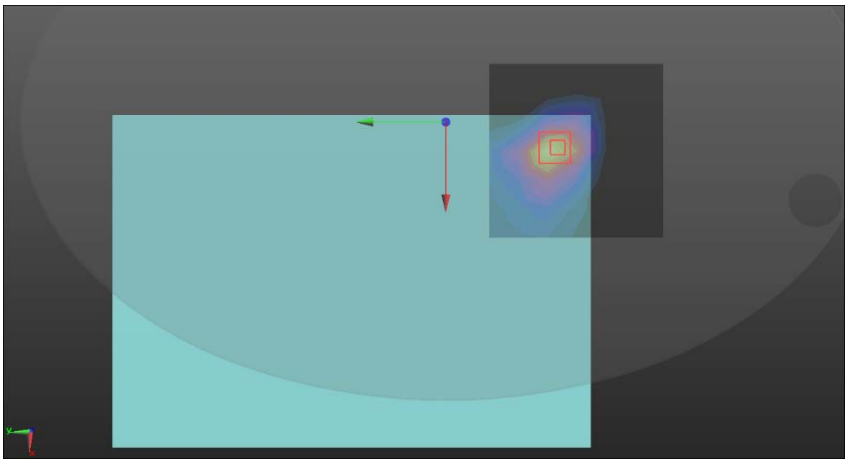
Body-Supported	Bottom

Communication System: UID 10032 - CAA, IEEE 802.15.1 Bluetooth (GFSK, DH5); Frequency: 2440 MHz;Duty Cycle: 1:1.30557
Medium parameters used (interpolated): f = 2441 MHz; σ = 1.792 S/m; ε_r = 39.213; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3708; ConvF(7.48, 7.48, 7.48) @ 2441 MHz; Calibrated: 10/30/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn546; Calibrated: 11/11/2020
- Phantom: ELI V4.0 (20deg probe tilt); Type: QD OVA 001 Bx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Aux ANT/BLE/Area Scan (7x7x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 0.582 W/kg
Aux ANT/BLE/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.457 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.266 W/kg
SAR(1 g) = 0.465 W/kg; SAR(10 g) = 0.149 W/kg
Smallest distance from peaks to all points 3 dB below = 12.9 mm
Ratio of SAR at M2 to SAR at M1 = 46.2%



ANNEX B –RELEVANT PAGES FROM CALIBRATION REPORTS

DAE4 Sn: 546

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client SRTC (Auden)

Certificate No: DAE4-546_Nov20

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 546
Calibration procedure(s)	QA CAL-06.v30 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	November 11, 2020

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	07-Sep-20 (No:28647)	Sep-21
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	09-Jan-20 (in house check)	In house check: Jan-21
Calibrator Box V2.1	SE UMS 006 AA 1002	09-Jan-20 (in house check)	In house check: Jan-21

	Name	Function	Signature
Calibrated by:	Adrian Gehring	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	

Issued: November 11, 2020

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: DAE4-546_Nov20 Page 1 of 5

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1μV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	405.327 ± 0.02% (k=2)	404.085 ± 0.02% (k=2)	404.198 ± 0.02% (k=2)
Low Range	3.98640 ± 1.50% (k=2)	3.95766 ± 1.50% (k=2)	3.97834 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	245.5 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199987.63	-5.61	-0.00
Channel X	+ Input	20001.70	0.10	0.00
Channel X	- Input	-19997.98	3.77	-0.02
Channel Y	+ Input	199992.83	-0.56	-0.00
Channel Y	+ Input	19998.84	-2.81	-0.01
Channel Y	- Input	-20000.91	0.75	-0.00
Channel Z	+ Input	199993.75	0.08	0.00
Channel Z	+ Input	19999.41	-2.23	-0.01
Channel Z	- Input	-20001.69	0.13	-0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.84	-0.02	-0.00
Channel X	+ Input	201.65	0.33	0.17
Channel X	- Input	-198.36	0.19	-0.09
Channel Y	+ Input	2000.86	0.06	0.00
Channel Y	+ Input	200.45	-0.79	-0.39
Channel Y	- Input	-199.82	-1.08	0.54
Channel Z	+ Input	2000.61	-0.21	-0.01
Channel Z	+ Input	200.89	-0.29	-0.14
Channel Z	- Input	-199.63	-0.93	0.47

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-0.18	-0.80
	- 200	2.87	0.71
Channel Y	200	-0.28	-0.75
	- 200	-2.10	-1.84
Channel Z	200	3.72	3.00
	- 200	-4.69	-4.77

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-3.22	-3.28
Channel Y	200	9.64	-	-0.49
Channel Z	200	5.48	6.85	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15849	16854
Channel Y	16149	14320
Channel Z	15913	17064

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.79	-1.78	0.17	0.37
Channel Y	-0.79	-2.22	0.08	0.44
Channel Z	0.03	-1.28	0.83	0.41

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

EX3DV4 Sn:3708

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client SRTC (Auden) **Certificate No: EX3-3708_Oct20**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3708

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7
Calibration procedure for dosimetric E-field probes

Calibration date: October 30, 2020

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: CC2552 (20x)	31-Mar-20 (No. 217-03106)	Apr-21
DAE4	SN: 660	27-Dec-19 (No. DAE4-660_Dec19)	Dec-20
Reference Probe ES3DV2	SN: 3013	31-Dec-19 (No. ES3-3013_Dec19)	Dec-20
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-20)	In house check: Jun-22
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 18, 2020

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S Schweizerischer Kalibrierdienst
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Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z*: *A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3708

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.20	0.34	0.41	± 10.1 %
DCP (mV)[B]	98.7	105.3	103.1	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max dev.	Max Unc[E] (k=2)
0	CW	X	0.00	0.00	1.00	0.00	145.6	± 3.0 %	± 4.7 %
		Y	0.00	0.00	1.00		130.1		
		Z	0.00	0.00	1.00		135.7		
10352-AAA	Pulse Waveform (200Hz, 10%)	X	14.12	83.81	18.09	10.00	60.0	± 3.1 %	± 9.6 %
		Y	20.00	94.63	22.59		60.0		
		Z	92.00	108.00	25.00		60.0		
10353-AAA	Pulse Waveform (200Hz, 20%)	X	20.00	89.99	18.85	6.99	80.0	± 2.0 %	± 9.6 %
		Y	20.00	101.45	24.93		80.0		
		Z	20.00	91.27	19.65		80.0		
10354-AAA	Pulse Waveform (200Hz, 40%)	X	20.00	92.58	18.44	3.98	95.0	± 1.3 %	± 9.6 %
		Y	20.00	115.48	30.24		95.0		
		Z	20.00	94.27	19.62		95.0		
10355-AAA	Pulse Waveform (200Hz, 60%)	X	20.00	98.15	19.68	2.22	120.0	± 1.3 %	± 9.6 %
		Y	20.00	130.55	35.73		120.0		
		Z	20.00	99.33	20.75		120.0		
10387-AAA	QPSK Waveform, 1 MHz	X	1.74	66.98	15.65	1.00	150.0	± 2.1 %	± 9.6 %
		Y	1.81	68.07	15.99		150.0		
		Z	1.56	65.51	14.39		150.0		
10388-AAA	QPSK Waveform, 10 MHz	X	2.31	68.70	16.32	0.00	150.0	± 1.0 %	± 9.6 %
		Y	2.35	69.11	16.49		150.0		
		Z	2.05	66.84	15.08		150.0		
10396-AAA	64-QAM Waveform, 100 kHz	X	2.73	69.77	18.60	3.01	150.0	± 0.9 %	± 9.6 %
		Y	2.42	67.92	17.74		150.0		
		Z	2.86	70.59	18.64		150.0		
10399-AAA	64-QAM Waveform, 40 MHz	X	3.58	67.42	16.11	0.00	150.0	± 0.8 %	± 9.6 %
		Y	3.50	67.20	15.91		150.0		
		Z	3.41	66.76	15.48		150.0		
10414-AAA	WLAN CCDF, 64-QAM, 40MHz	X	4.92	65.79	15.77	0.00	150.0	± 1.8 %	± 9.6 %
		Y	4.78	65.71	15.58		150.0		
		Z	4.76	65.60	15.38		150.0		

Note: For details on UID parameters see Appendix

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 5).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY - Parameters of Probe: EX3DV4 - SN:3708

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $ms.V^{-2}$	T2 $ms.V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	45.2	342.39	36.63	6.19	0.72	4.99	1.19	0.21	1.00
Y	37.9	274.44	33.81	10.95	0.05	5.07	0.95	0.15	1.00
Z	39.0	283.08	33.71	9.49	0.50	5.01	1.82	0.07	1.01

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	174.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Note: Measurement distance from surface can be increased to 3-4 mm for an *Area Scan* job.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3708

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
450	43.5	0.87	10.12	10.12	10.12	0.14	1.20	± 13.3 %
750	41.9	0.89	9.75	9.75	9.75	0.35	1.09	± 12.0 %
835	41.5	0.90	9.39	9.39	9.39	0.53	0.80	± 12.0 %
1450	40.5	1.20	8.29	8.29	8.29	0.31	0.80	± 12.0 %
1750	40.1	1.37	8.27	8.27	8.27	0.32	0.86	± 12.0 %
1900	40.0	1.40	7.99	7.99	7.99	0.31	0.86	± 12.0 %
2000	40.0	1.40	7.94	7.94	7.94	0.33	0.86	± 12.0 %
2300	39.5	1.67	7.63	7.63	7.63	0.27	0.86	± 12.0 %
2450	39.2	1.80	7.48	7.48	7.48	0.35	0.86	± 12.0 %
2600	39.0	1.96	7.37	7.37	7.37	0.29	0.86	± 12.0 %
3300	38.2	2.71	6.95	6.95	6.95	0.35	1.30	± 13.1 %
3500	37.9	2.91	6.78	6.78	6.78	0.35	1.30	± 13.1 %
3700	37.7	3.12	6.60	6.60	6.60	0.35	1.30	± 13.1 %
3900	37.5	3.32	6.24	6.24	6.24	0.40	1.60	± 13.1 %
4100	37.2	3.53	6.01	6.01	6.01	0.40	1.60	± 13.1 %
4200	37.1	3.63	5.93	5.93	5.93	0.45	1.70	± 13.1 %
4400	36.9	3.84	5.79	5.79	5.79	0.40	1.70	± 13.1 %
4600	36.7	4.04	5.77	5.77	5.77	0.40	1.70	± 13.1 %
4800	36.4	4.25	5.70	5.70	5.70	0.40	1.80	± 13.1 %
4950	36.3	4.40	5.68	5.68	5.68	0.40	1.80	± 13.1 %
5200	36.0	4.66	5.57	5.57	5.57	0.40	1.80	± 13.1 %
5300	35.9	4.76	5.43	5.43	5.43	0.40	1.80	± 13.1 %
5500	35.6	4.96	5.16	5.16	5.16	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.95	4.95	4.95	0.40	1.80	± 13.1 %
5800	35.3	5.27	5.12	5.12	5.12	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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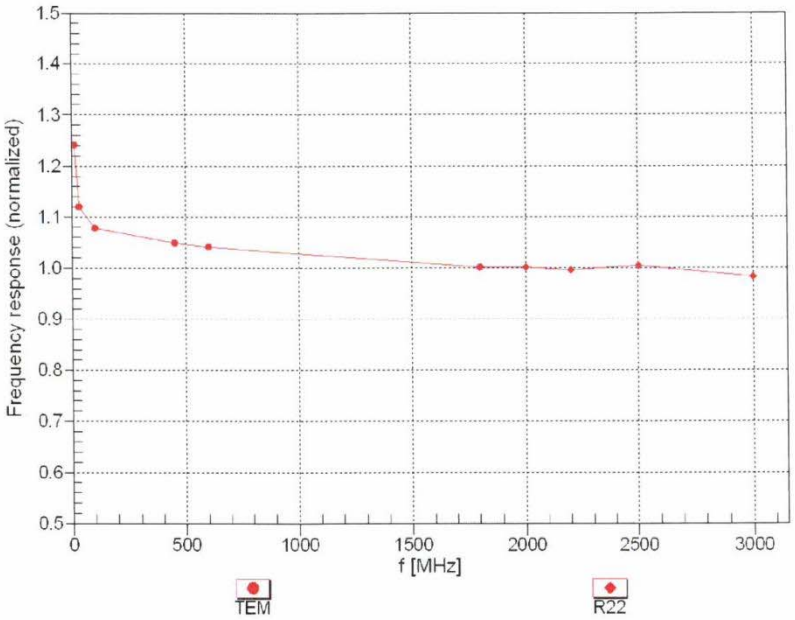
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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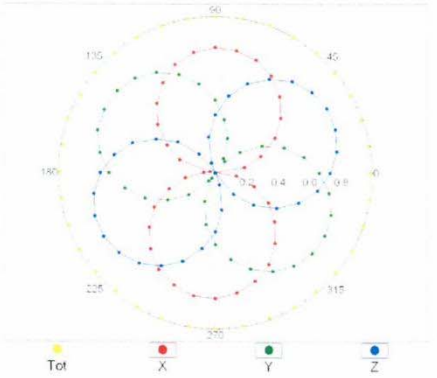
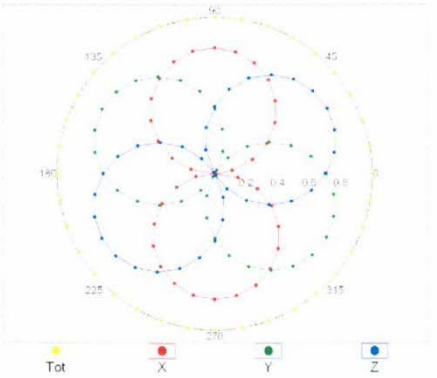
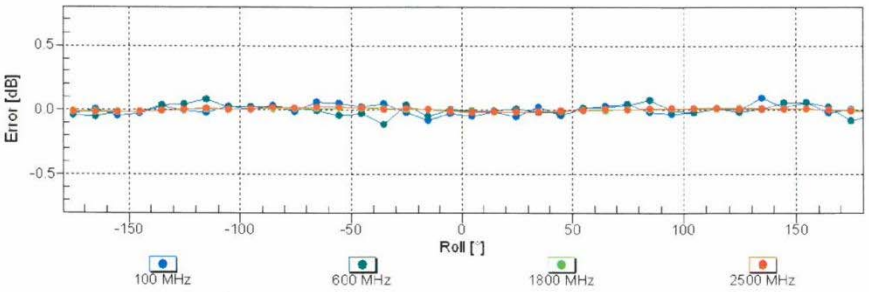
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



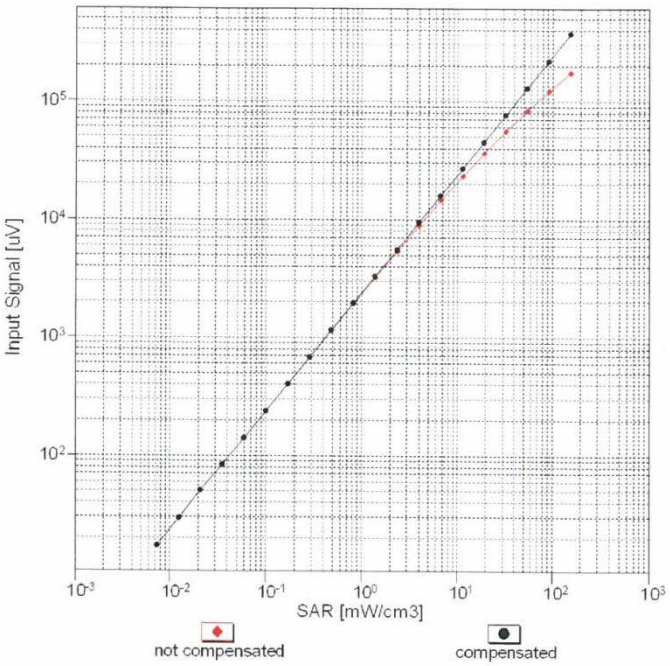
f=1800 MHz,R22

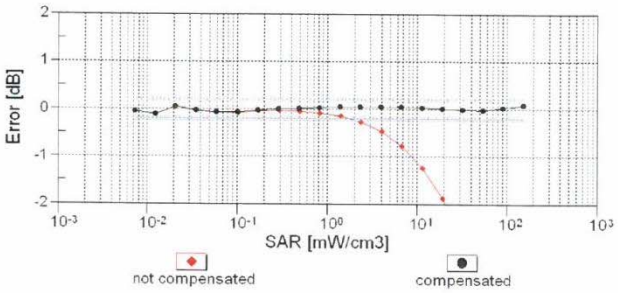




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)
(TEM cell , f_{eval}= 1900 MHz)

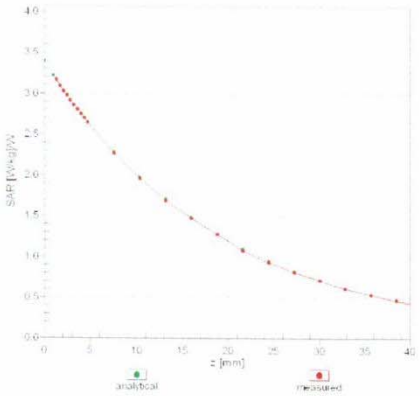




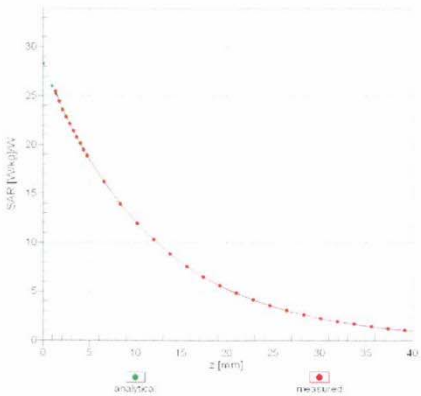
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

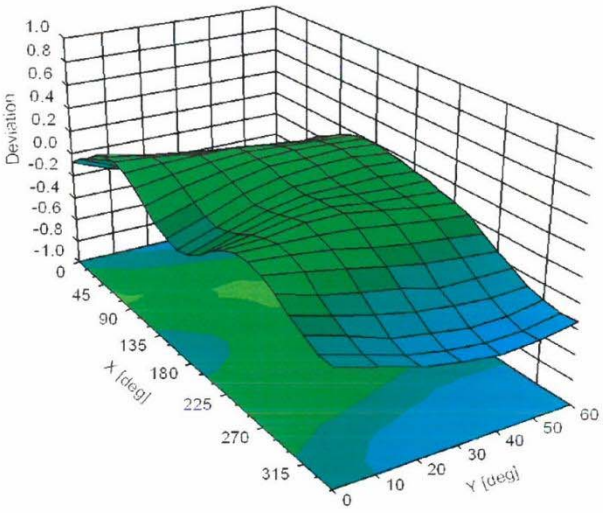


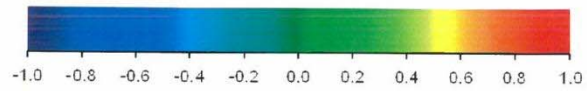
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Appendix: Modulation Calibration Parameters

UID	Rev	Communication System Name	Group	PAR (dB)	Unc[E] (k=2)
0		CW	CW	0.00	± 4.7 %
10010	CAA	SAR Validation (Square, 100ms, 10ms)	Test	10.00	± 9.6 %
10011	CAB	UMTS-FDD (WCDMA)	WCDMA	2.91	± 9.6 %
10012	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	WLAN	1.87	± 9.6 %
10013	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	WLAN	9.46	± 9.6 %
10021	DAC	GSM-FDD (TDMA, GMSK)	GSM	9.39	± 9.6 %
10023	DAC	GPRS-FDD (TDMA, GMSK, TN 0)	GSM	9.57	± 9.6 %
10024	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	GSM	6.56	± 9.6 %
10025	DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	GSM	12.62	± 9.6 %
10026	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	GSM	9.55	± 9.6 %
10027	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	GSM	4.80	± 9.6 %
10028	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	GSM	3.55	± 9.6 %
10029	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	GSM	7.78	± 9.6 %
10030	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	Bluetooth	5.30	± 9.6 %
10031	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	Bluetooth	1.87	± 9.6 %
10032	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	Bluetooth	1.16	± 9.6 %
10033	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	Bluetooth	7.74	± 9.6 %
10034	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	Bluetooth	4.53	± 9.6 %
10035	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	Bluetooth	3.83	± 9.6 %
10036	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	Bluetooth	8.01	± 9.6 %
10037	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	Bluetooth	4.77	± 9.6 %
10038	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	Bluetooth	4.10	± 9.6 %
10039	CAB	CDMA2000 (1xRTT, RC1)	CDMA2000	4.57	± 9.6 %
10042	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	AMPS	7.78	± 9.6 %
10044	CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	AMPS	0.00	± 9.6 %
10048	CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	DECT	13.80	± 9.6 %
10049	CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	DECT	10.79	± 9.6 %
10056	CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	TD-SCDMA	11.01	± 9.6 %
10058	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	GSM	6.52	± 9.6 %
10059	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	WLAN	2.12	± 9.6 %
10060	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	WLAN	2.83	± 9.6 %
10061	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	WLAN	3.60	± 9.6 %
10062	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	WLAN	8.68	± 9.6 %
10063	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	WLAN	8.63	± 9.6 %
10064	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	WLAN	9.09	± 9.6 %
10065	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	WLAN	9.00	± 9.6 %
10066	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	WLAN	9.38	± 9.6 %
10067	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	WLAN	10.12	± 9.6 %
10068	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	WLAN	10.24	± 9.6 %
10069	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	WLAN	10.56	± 9.6 %
10071	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	WLAN	9.83	± 9.6 %
10072	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	WLAN	9.62	± 9.6 %
10073	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	WLAN	9.94	± 9.6 %
10074	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	WLAN	10.30	± 9.6 %
10075	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	WLAN	10.77	± 9.6 %
10076	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	WLAN	10.94	± 9.6 %
10077	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	WLAN	11.00	± 9.6 %
10081	CAB	CDMA2000 (1xRTT, RC3)	CDMA2000	3.97	± 9.6 %
10082	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	AMPS	4.77	± 9.6 %
10090	DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	GSM	6.56	± 9.6 %
10097	CAC	UMTS-FDD (HSDPA)	WCDMA	3.98	± 9.6 %
10098	DAC	UMTS-FDD (HSUPA, Subtest 2)	WCDMA	3.98	± 9.6 %