TEST REPORT

EUT Description	**WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card**
Brand Name	**Intel® Wi-Fi 6E AX211**
Model Name	**AX211D2W**
FCC ID	**PD9AX211D2**
Date of Test Start/End	**2022-01-18 / 2022-01-20**
Features	**802.11ax, Dual Band, 2x2 Wi-Fi 6 + Bluetooth® 5.2** (see section 5)
Description	**WLAN module + Intel PIFA antenna**

Applicant	**Intel Mobile Communications**
Address	**100 Center Point Circle, Suite 200 / Columbia, SC 29210 / United States**
Contact Person	**Steven Hackett**
Email	**steven.c.hackett@intel.com**

Reference Standards	**FCC 47 CFR Part §2.1093** (see section 1)	
RF Exposure Environment	**Portable devices - General population/uncontrolled exposure**	
	Testing Result	Limit
Maximum Power Density Result & Limit	**4.58 W/m² (4cm²)**	**10 W/m² (4cm²)**
Maximum SAR Result & Limit	**0.48 W/kg (1g)**	**1.6 W/kg (1g)**
Min. test separation distance	**5mm to phantom (SAR), 5mm to probe tip (PD)**	

Test Report identification	**211006-01.TR02**
Revision Control	**Rev. 00** **This test report revision replaces any previous test report revision** (see section 8)

The test results relate only to the samples tested.

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1. Standards, reference documents and applicable test methods

FCC	1. FCC 47 CFR Part §2.1093 – Radiofrequency radiation exposure evaluation: portable devices. Edition October 2019 2. FCC 47 CFR Part §1.1310 – Radiofrequency radiation exposure limits. Edition October 2019 3. FCC OET KDB 248227 D01 v02r02 - SAR guidance for IEEE 802.11 (Wi-Fi) transmitters. 4. FCC OET KDB 447498 D01 v06 -RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices. 5. FCC OET KDB 865664 D01 v01r04 - SAR Measurement Requirements for 100 MHz to 6 GHz. 6. FCC OET KDB 865664 D02 v01r02 - RF Exposure Compliance Reporting and Documentation Considerations. 7. IEEE Std 1528-2013 - IEEE Recommended Practice Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques… 8. RF Exposure Policies and Procedures: TCB Workshop – October 2020 9. IEC/IEEE 62209-1528:2020 Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz) 10. SPEAG Application Note – 5G Compliance Testing with DASY6 (5GModule V1.0Beta)

2. General conditions, competences and guarantees

- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm recognized by the FCC, with Designation Number FR0011.
- ✓ Intel WRF Lab declines any responsibility with respect to the identified information provided by the customer and that may affect the validity of results.
- ✓ Intel WRF Lab only provides testing services and is committed to providing reliable, unbiased test results and interpretations.
- ✓ Intel WRF Lab is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.
- ✓ Intel WRF Lab has developed calibration and proficiency programs for its measurement equipment to ensure correlated and reliable results to its customers.
- ✓ This report is only referred to the item that has undergone the test.
- ✓ This report does not imply an approval of the product by the Certification Bodies or competent Authorities.

3. Environmental Conditions

✓ At the site where the measurements were performed the following limits were not exceeded during the tests:

Temperature	22.8ºC ± 2ºC
Humidity	47.0% ± 10%
Liquid Temperature	19.7ºC ± 2ºC

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt
#01	201120-03.S06	WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card	AX211D2W	WFM:D8F8834E4CF1	2020-11-23
	210611-02.S32	Extender Board	PCB00651_01	6515219-224 / AS000651-1-502	2021-08-06
	170000-01. S12	Laptop	DELL Latitude 7490	9KWMRQ2	2020-10-22
	180001-01.S19	Socket	-	-	2018-18-18
	200611-03. S22	Reference Antenna	WRF-BR-PIFA-V3.2	-	2020-07-20

5. EUT Features

The herein information is provided by the customer

Brand Name	Intel® Wi-Fi 6E AX211
Model Name	AX211D2W
Software Version	99.3500.51.0-00830
Driver Version	WLAN 99.0.58.3
Prototype / Production	Production
Host Identification	WLAN module
Supported Radios	802.11ax 6.0GHz (5925.0-7125.0MHz)
Antenna Information	See table below. See Annex *F* for more details on antennas location.
Simultaneous Transmission Configurations	WLAN 6GHz Main + BT Aux WLAN 6GHz Main + WLAN 6GHz Aux WLAN 6GHz Main + WLAN 6GHz Aux + BT Aux
Additional Information	No WWAN transmitter is considered in this report 5.60-5.65 GHz band (TDWR) is supported by the device Band gap is supported by the device

Transmitter	Main – Chain B/Tx2	Aux – Chain A/Tx1
Manufacturer	Intel	Intel
Antenna type	PIFA	PIFA
Part number	na	na

See Annex *F* for more details on antennas location.

Supported Radios

Mode	Duty Cycle	Modulation	Band	UL Freq Range (MHz)	Measured Max. Conducted Power (dBm)
802.11ax	100%	BPSK QPSK 16QAM 64QAM 256QAM	6.2GHz	5955-6415	13.48
802.11ax	100%	BPSK QPSK 16QAM 64QAM 256QAM	6.5GHz	6435-6515	13.43
802.11ax	100%	BPSK QPSK 16QAM 64QAM 256QAM	6.7GHz	6535-6855	13.37
802.11ax	100%	BPSK QPSK 16QAM 64QAM 256QAM	7.0GHz	6875-7115	13.49

NM: Not Measured

Maximum Output power specification + Tune up tolerance limit			SISO mode	
Equipment Class	Mode	BW (MHz)	Chain A/Tx1 (dBm)	Chain B/Tx2 (dBm)
U-NII-5	802.11ax	20/40/80/160	13.50	13.50
U-NII-6	802.11ax	20/40/80/160	13.50	13.50
U-NII-7	802.11ax	20/40/80/160	13.50	13.50
U-NII-8	802.11ax	20/40/80/160	13.50	13.50

6. Remarks and comments

1. The conducted values are obtained by applying the available power table to the AX211D2W Intel module installed in the WLAN module identified in this report
2. Only the plots for the test positions with the highest measured SAR/PD per band/mode are included in Annex C

7. Test Verdicts summary

The statement of conformity to applicable standards in the table below are based on the measured values, without taking into account the measurement uncertainties.

Standard	Band	Highest Reported PS_{tot} avg [W/m^2] 4cm^2	Verdict
802.11ax	6.2GHz	4.58	P
802.11ax	6.5GHz	3.94	P
802.11ax	6.7GHz	3.76	P
802.11ax	7.0GHz	3.06	P

Standard	Band	Highest Reported SAR [W/kg]	Verdict
802.11ax	6.2GHz	0.48	P
802.11ax	6.5GHz	0.38	P
802.11ax	6.7GHz	0.33	P
802.11ax	7.0GHz	0.35	P

P: Pass
F: Fail
NM: Not Measured
NA: Not Applicable

According to the FCC OET KDB 690783 D01, this is the summary of the values for the Grant Listing:

Highest Reported SAR (1g) (W/kg)		
Exposure Condition	Equipment Class	
	DSS	U-NII
Body Worn	0.07	0.48
Simultaneous Tx	Sum-SAR: 1.02	Sum-SAR: 1.02

Considering the results of the performed test according to FCC 47CFR Part 2.1093 the item under test is IN COMPLIANCE with the requested specifications specified in Section1. Standards, reference documents and applicable test methods

8. Document Revision History

Revision #	Modified by	Revision Details
Rev. 00	A.Dihissou	First Issue

Annex A. PD Test & System Description

A.1 Power Density Definition

The power density for an electromagnetic field represents the rate of energy transfer per unit area.
The local power density (i.e. Poynting vector) at a given spatial point is deduced from electromagnetic fields by the following formula:

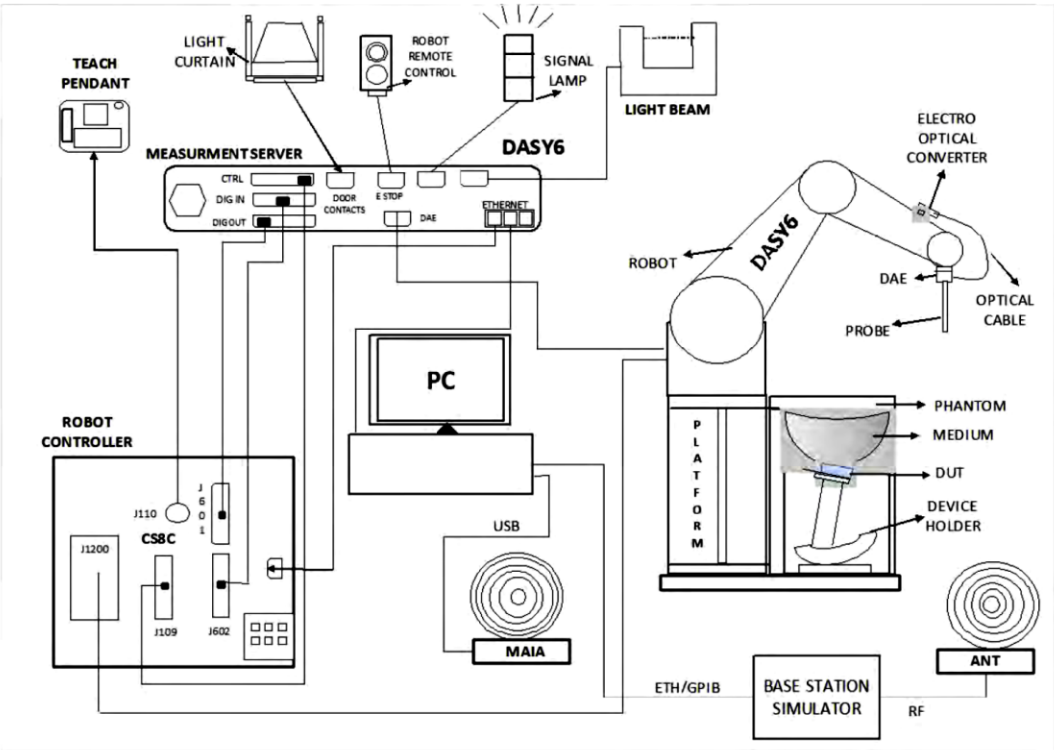
$$\overrightarrow{P_{local}} = \frac{1}{2}\text{Re}\left(\vec{E} \times \vec{H}^*\right)$$

Where $\vec{E}$ is the complex electric field peak phasor and $\vec{H}^*$ is the complex conjugate magnetic field peak phasor.
This power density is also called “single-point” or “spot power density”.
Considering that the FCC’s Maximum Permissible Exposure (MPE) limit is applicable on the average power density inside 1cm^2 area, the single point power densities in the evaluation plane should be averaged inside the 1cm^2 area.

A.2 SPEAG free space Measurement System

A.2.1 Measurement Setup

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



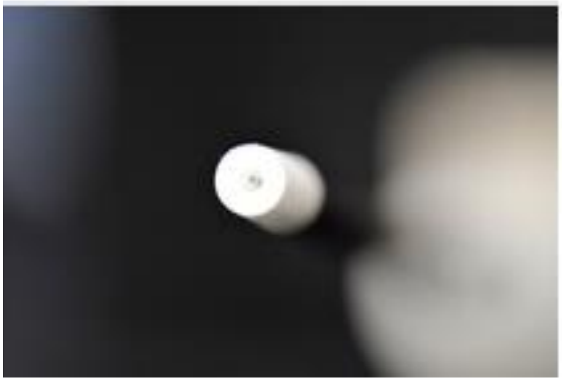
- ✓ A standard high precision 6-axis robot (Staübli TX/RX family) with controller, teach pendant and software. It includes an arm extension for accommodating the data acquisition electronics (DAE)
- ✓ An mm-wave E-field probe optimized and calibrated for the targeted measurements.
- ✓ A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- ✓ The Electro-optical Converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. The EOC signal is transmitted to the measurement server.
- ✓ The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movements interrupts.
- ✓ The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- ✓ A computer running Win7 professional operating system and the cDASY6 software.
- ✓ Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.

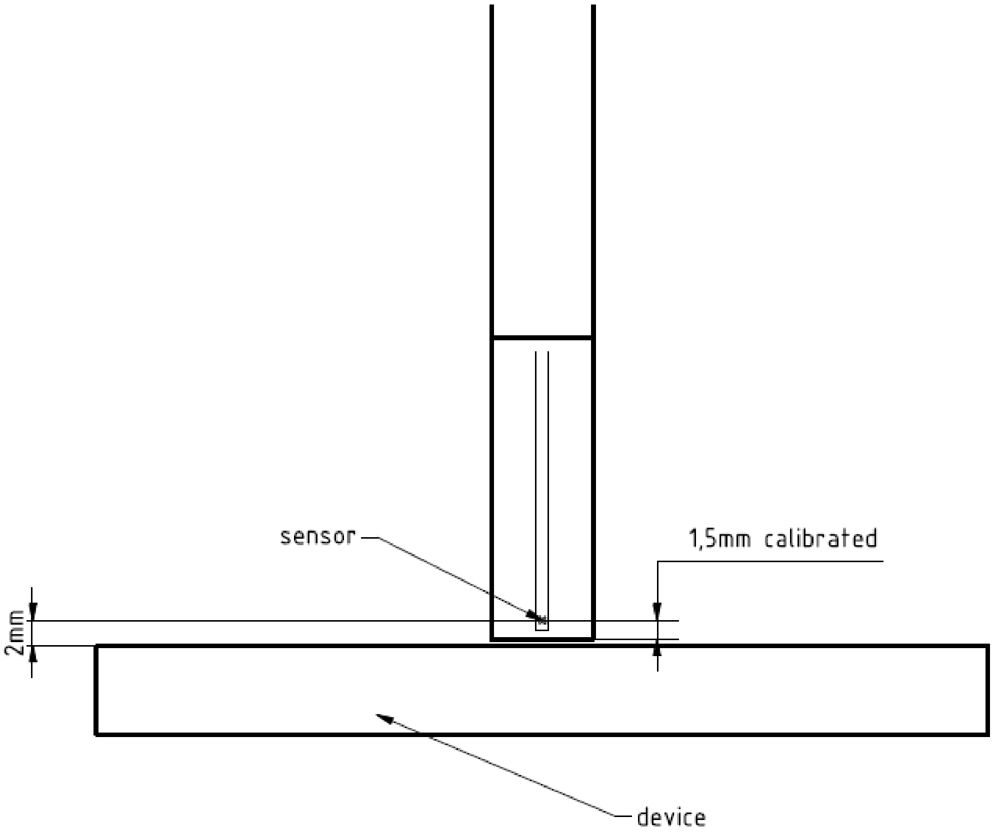
A.2.2 E-Field Measurement Probe

The probe consists of two dipoles (0.8 mm length) optimally arranged with different angles (γ_1 and γ_2) to obtain pseudo-vector information, printed on glass substrate protected by high density foam that allows low perturbation of the measured field.
Three or more measurements are taken for different probe rotational angles, deriving the amplitude and polarization information.

The probe's characteristics are:

Frequency Range	750 MHz – 110 GHz
Length	320 mm
Probe tip external diameter	8 mm
Probe's two dipoles length	0.9mm – Diode loaded
Probe's substrate	Quartz 0.9 x 20 x 0.18mm (εr=3.8)
Distance between diode sensors and probe's tip	1.5 mm
Axial Isotropy	±0.6 dB
Maximum operating E-field	3000 V/m
Lower E-field detection threshold	5 V/m @ 60 GHz
Minimum Mechanical separation between probe tip and a Surface	0.5mm
Calibration reference point	Diode Sensor





A.2.3 Worst Case Linearization Error

For continuously transmitting signals (100% duty cycle), the worst case linearization error is given by the difference between non linearized voltage and linearized voltage using CW parameters. The error is increasing with the voltage levels. In our particular case, the measured voltages averaged over the signal period are below 1mV. We use 1mV in the below calculation to have the worst case condition. The signal PAR (Peak to Average Ratio) is 6dB and the diode compression point 100mV.

The maximum voltage through the diode is given by:

$$\mathrm{vpeak} = \mathrm{vmeas\ avg} \times \mathrm{PARlinear}$$
$$vpeak = 1 * 4 = 4\ mV$$

The linearized voltage using CW parameter is given by:

$$vlin\ peak = vpeak + \frac{v_{peak}^2}{diode\ compression\ point}$$
$$vlin\ peak = 4 + \frac{4^2}{100} = 4.16\ mV$$

The worst case linearization error is:

$$lin\ error = \frac{vlin\ peak}{v\ peak} = \frac{4.16}{4} = 1.04 = 4\%$$

A.2.4 Data Evaluation

A.2.4.1 Scan

The scan involves the measurement of two planes with three different probe rotations. The grid steps are optimized by the software based on the test frequency. The location of the lowest measurement plane is defined by the distance of first measurement layer from device under test (DUT) entered by the user. The DUT location settings can be used to offset the center of the grid.

A.2.4.2 Total Field and Power Flux Density Reconstruction

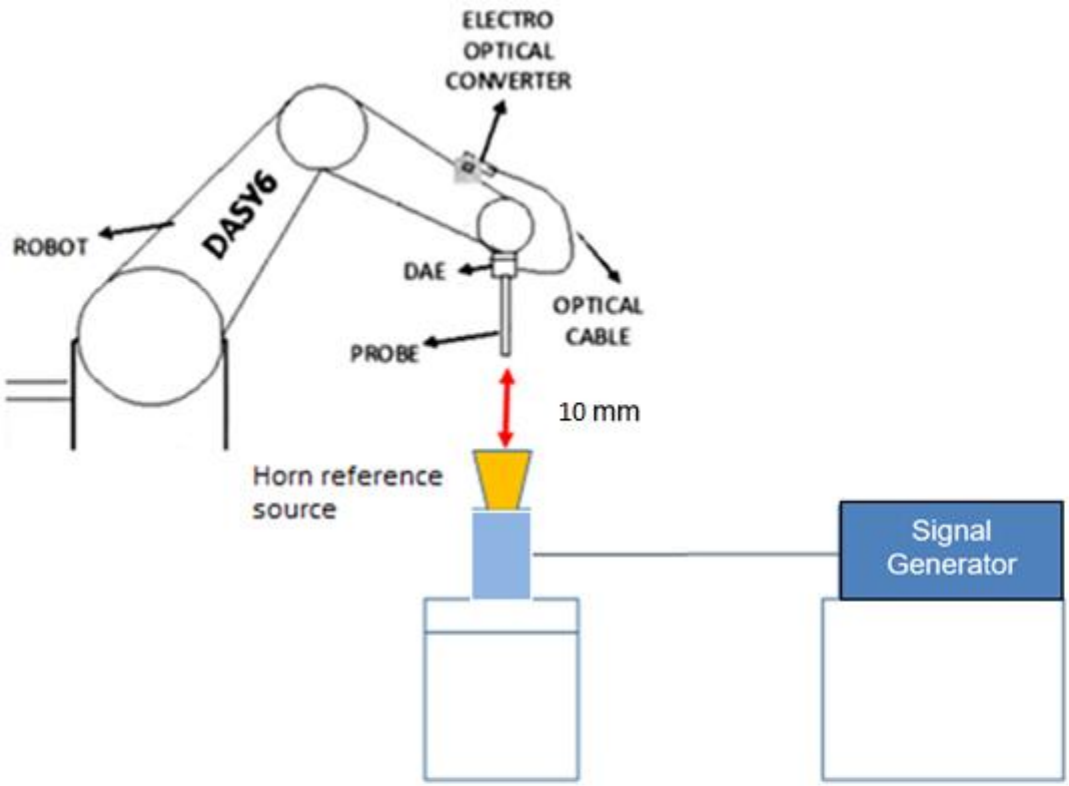
Computation of the power density in general requires knowledge of the electric (E-) and magnetic (H-) field amplitudes and phases in the plane of incidence. Reconstruction of these quantities from pseudo-vector E-field measurements is feasible, as they are constrained by Maxwell's equations.
The reconstruction algorithm developed by the system manufacturer, together with the ability of the probe to measure extremely close to the source without perturbing the field, permits reconstruction of the E- and H-fields, as well as of the power density, on measurement planes located as near as 0.5mm away in the frequency band of 60 GHz.

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 1 cm^2.

A.3 System Check

The system performance check verifies that the system operates within its specifications. 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 E-field 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.
In the simplified setup for system check, the EUT is replaced by a calibrated source and the power source is replaced by a controlled continuous wave generated by a signal generator. The calibrated source must be placed at the correct distance from the E-field probe according to the calibration certificate.

First, the power meter is connected to the output of the signal generator to measure the forward power at the location of the connector to the system check source. The signal generator is adjusted for the desired forward power to match the system check source calibration setup at the connector as read by power meter. Then the power meter is replaced by the system check source.



The output power on the reference source is set to 10.0 dBm (10 mW) and the measurement results E, H and Avg PD are compared with the Numerical modeling.

A.4 Test Equipment List

SAR system #1

ID #	Device	Type/Model	Serial Number	Manufacturer	Cal. Date	Cal. Due Date
001-000	6-Axis Robot	TX60 Lspeag	F17/59RCB1/A/01	STAÜBLI	NA	NA
001-004	Robot Controller	CS8C	F12/5MZ3A1/C/01	STAÜBLI	NA	NA
195-000	5G Phantom	mmWave	NA	SPEAG	NA	NA
001-002	Light Beam Unit	LB5/80	NA	Di-soric	NA	NA
001-013	Measurement Server	DASY6	1548	SPEAG	NA	NA
001-005	Electro Optical Converter	EOC60	1076	SPEAG	NA	NA
003-006	Measurement Software	DASY mmWave v2.4.0.55	9-5ED1AC01	SPEAG	NA	NA
443-000	E-Field probe 750MHz-110GHz	EUmmWV3	9538	SPEAG	2021-05-20	2022-05-20
085-000	Data Acquisition Electronics	DAE4	1517	SPEAG	2021-03-11	2022-03-11
001-003	Laptop Holder		N/A	SPEAG	NA	NA

Shared equipment

ID #	Device	Type/Model	Serial Number	Manufacturer	Cal. Date	Cal. Due Date
123-000	USB Power Sensor	NRP-Z81	102278	R&S	2021-04-13	2023-04-13
124-000	USB Power Sensor	NRP-Z81	102279	R&S	2021-04-13	2023-04-13
077-000	Coupler	CD0.5-8-20-30	1251-002	Amd-group	2021-08-13	2022-02-13
078-000	RF Cable	ST-18/SMAm/SMAm/48	-	Huber & Suhner	2021-08-14	2022-02-14
079-000	RF Cable	ST-18/SMAm/SMAm/48	-	Huber & Suhner	2021-08-14	2022-02-14
141-000	USB Power Sensor	NRP-Z81	104381	R&S	2020-06-03	2022-06-03
327-000	Temp & Humidity Logger	RA32E-TH1-RAS	RA32-F0DED9	AVTECH	2021-03-09	2023-03-09
098-000	Vector Signal Generator	SMW200A 20GHz	103732	R&S	2020-07-20	2022-07-20
198-000	0.8-21GHz RF amplifier	TVA-82-213A+	2004003	Mini-Circuits	2021-08-13	2022-02-13
014-023	Horn reference source	PE9859/SF-15	--	Pasternack	NA	NA

A.5 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the table below with a coverage factor of k = 2 to indicate a 95% level of confidence:

DASY6 Uncertainty Budget According to draft of the IEC/IEEE 63159 750 MHz – 110 GHz						
Error Description	Uncertainty Value (±dB)	Probability Distribution	Div.	(c_i)	Std. Unc. (±dB)	(v_i) V_{eff}
Measurement System						
Probe calibration	0.49	N	1	1	0.98	∞
Hemispherical Isotropy	0.50	R	√3	1	0.29	∞
Linearity	0.20	R	√3	1	0.12	∞
System Detection Limits	0.04	R	√3	1	0.02	∞
Data acquisition	0.03	N	1	1	0.03	∞
Field reconstruction	0.60	R	√3	0.3	0.35	∞
Probe Positioning Repeatabiility	0.04	R	√3	1	0.02	∞
Probe Positioning offset	0.30	R	√3	1	0.17	∞
Amplitude and Phase Noise	0.04	R	√3	1	0.02	∞
Spatial Averaging	0.1	R	√3	1	0.06	∞
Frequency Response	0.2	R	√3	1	0.12	∞
Test Sample Related						
Power Drift	0.21	R	√3	1	0.12	∞
Modulation response	0.40	R	√3	1	0.23	∞
Device holder influence	0.1	R	√3	1	0.06	∞
RF Ambient Noise	0.04	R	√3	1	0.02	∞
RF Ambient Reflections	0.04	R	√3	1	0.02	∞
Combined Std. Uncertainty					0.76 dB	∞
Expanded Std. Uncertainty 95%					**1.53 dB**	

A.6 RF Exposure Limits

Power density assessments have been made in line with the requirements of FCC 47CFR Part 2.1093, in particular chapter 1.1310 specifying the MPE limits, on the limitation of exposure of the general population / uncontrolled exposure for portable devices.

Exposure Type	Power density (S)
Limits for Occupational/Controlled Exposure. 1.5GHz – 100GHz	**50.0 W/m^2**
Limits for General Population/ Uncontrolled Exposure. 1.5GHz – 100GHz	**10.0 W/m^2**

Annex B. SAR Test & System Description

B.1 SAR Definition

Specific Absorption rate is defined as the time derivative of the incremental energy (dW) absorbed by (dissipated in) and incremental mass (dm) contained in a volume element (dV) of a given density (ρ).

$$SAR = \frac{d}{dt} \cdot \left(\frac{dW}{dm}\right) = \frac{d}{dt} \cdot \left(\frac{dW}{\rho \cdot dV}\right)$$

SAR is expressed in units of watts per kilogram (W/kg). SAR can be related to the electric field at a point by

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

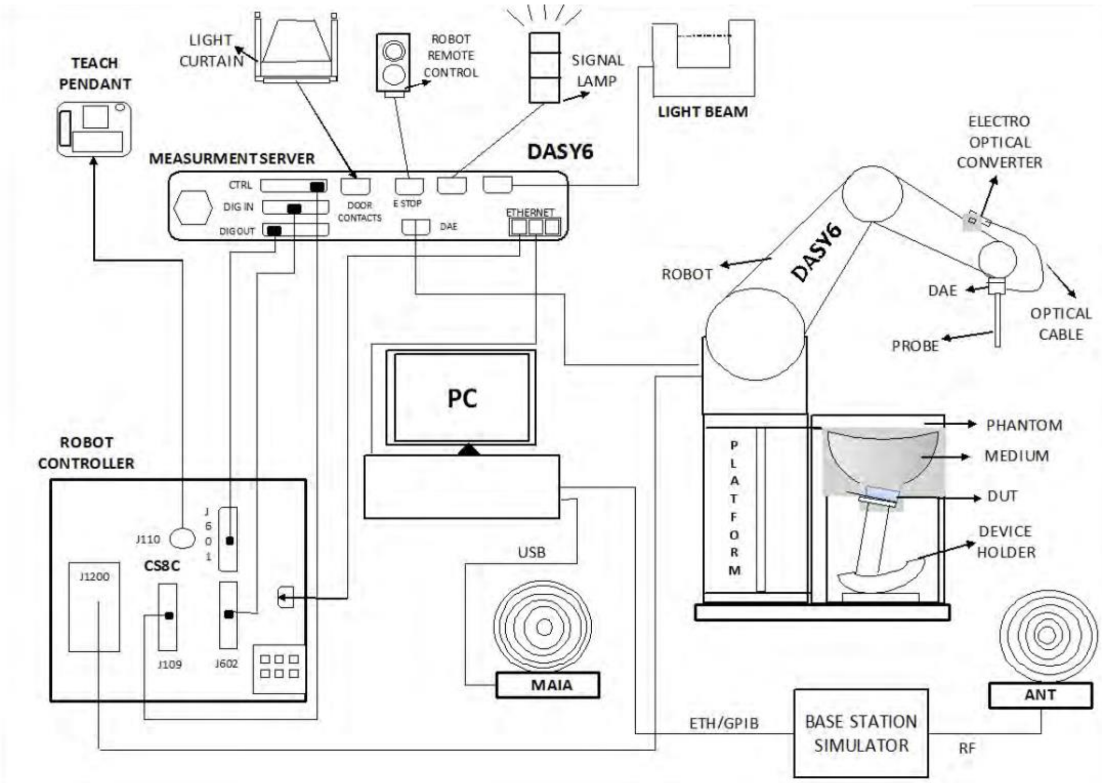
Where:

σ = Conductivity of the tissue (S/m)
ρ = Mass density of the tissue (kg/m3)
E = RMS electric field strength (V/m)

B.2 SPEAG SAR Measurement System

B.2.1 SAR Measurement Setup

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



- ✓ A standard high precision 6-axis robot (Staübli TX/RX family) with controller, teach pendant and software. It includes an arm extension for accommodating the data acquisition electronics (DAE)
- ✓ An isotropic field probe optimized and calibrated for the targeted measurements.
- ✓ A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- ✓ The Electro-optical Converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. The EOC signal is transmitted to the measurement server.
- ✓ The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movements interrupts.
- ✓ The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- ✓ A computer running Win7 professional operating system and the DASY6 software.
- ✓ Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- ✓ The phantom, the device holder and other accessories according to the targeted measurement.
- ✓ MAIA is a hardware interface (Antenna) used to evaluate the modulation and audio interference characteristics of RF signals.
- ✓ ANT is an ultra-wideband antenna for use with the base station simulators over 698 MHz to 6GHz for SAR cellular testing (not used for WLAN testing).
- ✓ The base station simulator is an equipment used for SAR cellular tests in order to emulate the cellular signals characteristics and behavior between a regular base station and the equipment under test.
- ✓ Tissue simulating liquid.
- ✓ System Validation dipoles.
- ✓ Network emulator or RF test tool

B.2.2 E-Field Measurement Probe

The probe is constructed using three orthogonal dipole sensors arranged on an interlocking, triangular prism core. The probe has built-in shielding against static charges and is contained within a PEEK cylindrical enclosure material at the tip.

The probe's characteristics are:

Frequency Range	30MHz – 10GHz
Length	337 mm
Probe tip external diameter	2.5 mm
Typical distance between dipoles and the probe tip	1 mm
Axial Isotropy (in human-equivalent liquids)	±0.3 dB
Hemispherical Isotropy (in human-equivalent liquids)	±0.5 dB
Linearity	±0.2 dB
Maximum operating SAR	100 W/kg
Lower SAR detection threshold	0.001 W/kg

B.2.3 SAM Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

The phantom's characteristics are:

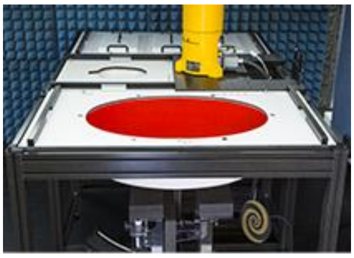
Material	Vinylester, glass fiber reinforced (VE-GF)
Shell thickness	2 mm ± 0.2 mm
Shell thickness at ERP	6 ± 0.2 mm
Filling volume	25 Liters
Dimensions	Length: 1000mm / Width: 500mm

B.2.4 Flat Phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

The phantom's characteristics are:

Material	Vinylester, glass fiber reinforced (VE-GF)
Shell thickness	2 mm ± 0.2 mm
Filling volume	30 Liters approx.
Dimensions	Major axis: 600mm / Minor axis: 400mm



B.2.5 Device Positioner

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of 0.5 mm would produce a SAR uncertainty of 20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

A simple but effective and easy-to-use extension for the Mounting Device; facilitates testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.); lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI and other Flat Phantoms.

B.3 Data Evaluation

- **Power Reference measurement**

The robot measures the E field in a specified reference position that can be either the selected section's grid reference point or a user point in this section at 4mm of the inner surface of the phantom, 2mm for frequencies above 3GHz.

- **Area Scan**

Measurement procedures for evaluating SAR from wireless handsets typically start with a coarse measurement grid to determine the approximate location of the local peak SAR values. This is known as the area-scan procedure. The SAR distribution is scanned along the inside surface of one side of the phantom head, at least for an area larger than the projection of the handset and antenna. The distance between the measured points and phantom surface should be less than 8 mm, and should remain constant (with variation less than ± 1 mm) during the entire scan in order to determine the locations of the local peak SAR with sufficient accuracy. The angle between the probe axis and the surface normal line is recommended but not required to be less than 30°. If this angle is larger than 30° and the closest point on the probe-tip housing to the phantom surface is closer than a probe diameter, the boundary effect may become larger and polarization dependent. This additional uncertainty needs to be analyzed and accounted for. To achieve this, modified test procedures and additional uncertainty analyses not described in this recommended practice may be required. The measurement and interpolation point spacing should be chosen such as to allow identification of the local peak locations to within one-half of the linear dimension of a side of the zoom-scan volume. Because a local peak having specific amplitude and steep gradients may produce a lower peak spatial-average SAR compared to peaks with slightly lower amplitude and less steep gradients, it is necessary to evaluate these other peaks as well. However, since the spatial gradients of local SAR peaks are a function of the wavelength inside the tissue-equivalent liquid and the incident magnetic field strength, it is not necessary to evaluate local peaks that are less than 2 dB or more below the global maximum peak. Two-dimensional spline algorithms (Brishoual et al. 2001; Press et al., 1996) are typically used to determine the peaks and gradients within the scanned area. If a peak is found at a distance from the scan border of less than one-half the edge dimension of the desired 1 g or 10 g cube, the measurement area should be enlarged if possible.

- **Zoom Scan**

To evaluate the peak spatial-average SAR values for 1 g or 10 g cubes, fine resolution volume scans, called zoom scans, are performed at the peak SAR locations identified during the area scan. The minimum zoom scan volume size should extend at least 1.5 times the edge dimension of a 1 g cube in all directions from the center of the scan volume, for both 1 g and 10 g peak spatial-average SAR evaluations. Along the phantom curved surfaces, the front face of the volume facing the tissue/liquid interface conforms to the curved boundary, to ensure that all SAR peaks are captured. The back face should be equally distorted to maintain the correct averaging mass. The flatness and orientation of the four side faces are unchanged from that of a cube whose orientation is within ± 30° of the line normal to the phantom at the center of the cube face next to the phantom surface. The peak local SAR locations that were determined in the area scan (interpolated values) should be used for the centers of the zoom scans. If a scan volume cannot be centered due to proximity of a phantom shape feature, the probe should be tilted to allow scan volume enlargement. If probe tilt is not feasible, the zoom-scan origin may be shifted, but not by more than half of the 1 g or 10 g cube edge dimension.

After the zoom-scan measurement, extrapolations from the closest measured points to the surface, for example along lines parallel to the zoom-scan centerline, and interpolations to a finer resolution between all measured and extrapolated points are performed. Extrapolation algorithm considerations are described in 6.5.3, and 3-D spline methods (Brishoual et al., 2001; Kreyszig, 1983; Press et al., 1996) can be used for interpolation. The peak spatial-average SAR is finally determined by a numerical averaging of the local SAR values in the interpolation grid, using for example a trapezoidal algorithm for the integration (averaging).

In some areas of the phantom, such as the jaw and upper head regions, the angle of the probe with respect to the line normal to the surface may be relatively large, e.g., greater than ± 30º, which could increase the boundary effect error to a larger level. In these cases, during the zoom scan a change in the orientation of the probe, the phantom, or both is recommended but not required for the duration of the zoom scan, so that the angle between the probe axis and the line normal to the surface is within 30º for all measurement points.

- **Power Drift measurement**

The robot re-measures the E-Field in the same reference location measured at the Power Reference. The drift measurement gives the field difference in dB from the first to the last reference reading. This allows a user to monitor the power drift of the device under test that must remain within a maximum variation of ±5%.

- **Post-processing**

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1528 and IEC 62209-1/2 standards. It can be conducted for 1g and 10g.

The software allows evaluations that combine measured data and robot positions, such as:

- ✓ Maximum search
- ✓ Extrapolation
- ✓ Boundary correction
- ✓ Peak search for averaged SAR

Interpolation between the measured points is performed when the resolution of the grid is not fine enough to compute the average SAR over a given mass.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.

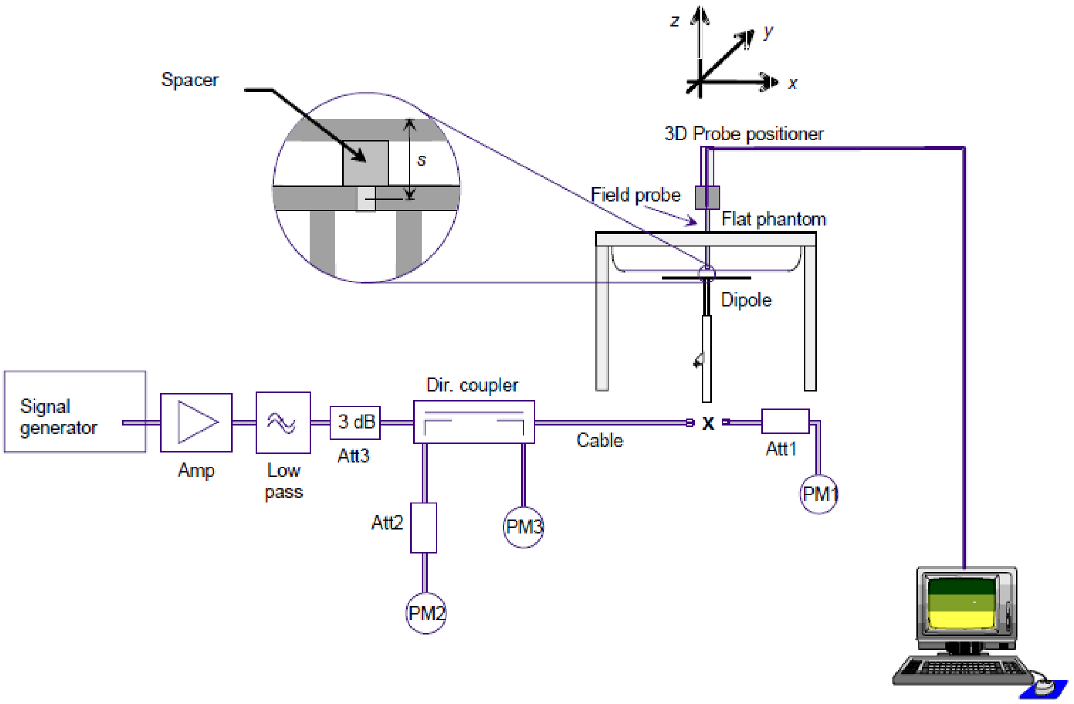
B.4 System and Liquid Check

B.4.1 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 SAR 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.

In the simplified setup for system check, the EUT is replaced by a calibrated dipole and the power source is replaced by a controlled continuous wave generated by a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the phantom at the correct distance.



The equipment setup is shown below:

- ✓ Signal Generator
- ✓ Amplifier
- ✓ Directional coupler
- ✓ Power meter
- ✓ Calibrated dipole

First, the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the connector (x) to the system check source. The signal generator is adjusted for the desired forward power at the connector as read by power meter PM1 after attenuation Att1 and also as coupled through Att2 to PM2. After connecting the cable to the source, the signal generator is readjusted for the same reading at power meter PM2.

SAR results are normalized to a forward power of 1W to compare the values with the calibration reports results as described at IEEE 1528 and IEC 62209 standards.

B.4.2 Liquid Check

The dielectric parameters check is done prior to the use of the tissue simulating liquid. The verification is made by comparing the relative permittivity and conductivity to the values recommended by the applicable standards.

The liquid verification was performed using the following test setup:

- ✓ VNA (Vector Network Analyzer)
- ✓ Open-Short-Load calibration kit
- ✓ RF Cable
- ✓ Open-Ended Coaxial probe
- ✓ DAK software tool
- ✓ SAR Liquid
- ✓ De-ionized water
- ✓ Thermometer

These are the target dielectric properties of the tissue-equivalent liquid material according to the manufacturer's datasheet:

Frequency	Head Tissue Simulating Media	
(MHz)	ε_r (F/m)	σ (S/m)
6000	35.07	5.48
6500	34.46	6.07
7000	33.88	6.65

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)

The measurement system implement a SAR error compensation algorithm as documented in IEEE Std 1528-2013 (equivalent to draft standard IEEE P1528-2011) to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters (applied to only scale up the measured SAR, and not downward) so, according to FCC OET KDB 865664 D01, the tolerance for ε_r and σ may be relaxed to ± 10%.

B.5 Test Equipment List

SAR system #1

ID #	Device	Type/Model	Serial Number	Manufacturer	Cal. Date	Cal. Due Date
001-000	6-Axis Robot	TX60L speag	F12/5MZ3A1/A/01	STAÜBLI	NA	NA
001-002	Light Beam Unit			Di-soric	NA	NA
001-003	Laptop Holder		N/A	SPEAG	NA	NA
001-004	Robot Controller	CS8C	F12/5MZ3A1/C/01	STAÜBLI	NA	NA
001-005	Electro Optical Converter	EOC60	1076	SPEAG	NA	NA
086-000	Dosimetric E-Field probe 750-5800MHz	EX3DV4	7455	SPEAG	2021-03-20	2022-03-20
085-000	Data Acquisition Electronics	DAE4	1517	SPEAG	2021-03-11	2022-03-11
001-008	Oval Flat Phantom	ELI V8.0	2059	SPEAG	NA	NA
001-009	Measurement Software	DASY6 v6.14	9-618AE2F1	SPEAG	NA	NA
001-010	MAIA Antenna	MAIA	1255	SPEAG	NA	NA

Shared equipment

ID #	Device	Type/Model	Serial Number	Manufacturer	Cal. Date	Cal. Due Date
123-000	USB Power Sensor	NRP-Z81	102278	R&S	2021-04-13	2023-04-13
124-000	USB Power Sensor	NRP-Z81	102279	R&S	2021-04-13	2023-04-13
099-000	Liquid measurement SW	DAK-3.5 V2.6.0.5	9-2687B491	SPEAG	NA	NA
369-000	Dielectric Probe Kit	DAK-3.5	1309	SPEAG	2021-03-10	2023-03-10
077-000	Coupler	CD0.5-8-20-30	1251-002	Amd-group	2021-08-13	2022-02-13
078-000	RF Cable	ST-18/SMAm/SMAm/48	-	Huber & Suhner	2021-08-14	2022-02-14
079-000	RF Cable	ST-18/SMAm/SMAm/48	-	Huber & Suhner	2021-08-14	2022-02-14
126-000	Vector Signal Generator	ESG E4438C	MY45092885	Agilent	2021-05-27	2023-05-27
327-000	Temp & Humidity Logger	RA32E-TH1-RAS	RA32-F0DED9	AVTECH	2021-03-09	2023-03-09
098-000	Vector Signal Generator	SMW200A 20GHz	103732	R&S	2020-07-20	2022-07-20
339-000	VNA Analyzer	ZNB 40	101740	R&S	2020-07-10	2022-07-10
198-000	Power Amplifier	TVA-82-213A+	2004003	Mini-circuits	2021-08-13	2022-02-13
096-000	System Validation Dipole 6500MHz	D6.5GHzV2	1013	SPEAG	2020-09-25	2022-09-25

B.5.1 Tissue Simulant Liquid

TSL	Manufacturer / Model	Freq Range (MHz)	Main Ingredients
Head WideBand	SPEAG HBBL600-10000V6 Batch 191016-02	600-10000	Ethanediol, Sodium petroleum sulfonate, Hexylene Glycol / 2-Methyl-pentane-2.4-diol, Alkoxylated alcohol

B.6 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the table below with a coverage factor of k = 2 to indicate a 95% level of confidence:

SPEAG DASY6 Uncertainty Budget According to IEC/IEEE 62209-1528 (6 GHz - 10 GHz)								
Symbol	Error Description	Uncert. Value	Prob Dist.	Div.	(ci) 1g	(ci) 10g	Std Unc. (1g)	Std Unc. (10g)
Measurement System Errors								
CF	*Probe Calibration*	±18.6 %	N	2	1	1	±9.3 %	±9.3 %
CF_{drift}	Probe Calibration Drift	±1.0 %	N	1	1	1	±1.0 %	±1.0 %
LIN	Probe Linearity	±4.7 %	R	√3	1	1	±2.7 %	±2.7 %
BBS	Broadband Signal	±3.0 %	N	2	1	1	±1.5 %	±1.5 %
ISO	*Axial Isotropy*	±4.7 %	R	√3	0.5	0.5	±1.4 %	±1.4 %
ISO	Hemspherical Isotropy	±9.6 %	R	√3	0.5	0.5	±2.8 %	±2.8 %
DAE	Data Acquisition	±0.3 %	N	1	1	1	±0.3 %	±0.3 %
AMB	RF Ambient	±1.8 %	N	1	1	1	±1.8 %	±1.8 %
Δ_{sys}	Probe Positioning	±0.2 %	N	1	0.33	0.33	±0.1 %	±0.1 %
DAT	Data Processing	±3.5 %	N	1	1	1	±3.5 %	±3.5 %
Phantom and Device Errors								
LIQ(σ)	Conductivity $(meas.)_{DAK}$	±2.5 %	N	1	0.78	0.71	±2.0 %	±1.8 %
$LIQ(T_\sigma)$	Conductivity $(temp.)_{BB}$	±2.4 %	R	√3	0.78	0.71	±1.1 %	±1.0 %
EPS	Phantom Permittivity	±14.0 %	R	√3	0.5	0.5	±4.0 %	±4.0 %
DAS	Distance DUT - TSL	±2.0 %	N	1	2	2	±4.0 %	±4.0 %
H	Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %
MOD	DUT $Modulation_m$	±2.4 %	R	√3	1	1	±1.4 %	±1.4 %
TAS	Time-average SAR	±2.6 %	R	√3	1	1	±1.5 %	±1.5 %
RF_{drift}	DUT drift	±5.0 %	N	1	1	1	±2.9 %	±2.9 %
Correction to the SAR results								
C(ε, σ)	Deviation to Target	±1.9 %	N	1	1	0.84	±1.9 %	±1.6 %
C(R)	SAR $scaling_p$	±0 %	R	√3	1	1	±0 %	±0 %
Combined Std. Uncertainty							±13.7 %	±13.7 %
Expanded STD Uncertainty							**±27.5 %**	**±27.3 %**

B.7 RF Exposure Limits

SAR assessments have been made in line with the requirements of FCC 47CFR Part 2.1093 on the limitation of exposure of the general population / uncontrolled exposure for portable devices.

Exposure Type	General Population / Uncontrolled Environment
Peak spatial-average SAR (averaged over any 1 gram of tissue)	**1.6 W/kg**
Whole body average SAR	**0.08 W/kg**
Peak spatial-average SAR (extremities) (averaged over any 10 grams of tissue)	**4.0 W/kg**

Annex C. Test Results

The herein test results were performed by:

Test case measurement	Test Personnel
Conducted measurement	A.Dihissou
SAR/PD measurement	A.Dihissou,

C.1 Test Conditions

C.1.1 Test positions relative to the phantom

The device under test was an Intel® Wi-Fi 6E AX211 card inside an extender host platform (WLAN module) using a set of PIFA antennas. The card was operated utilizing proprietary software (DRTU version 99.3500.51.0-00830) and each channel was measured using a broadband power meter to determine the maximum average power.

As per the Interim Procedures for UNII 6-7GHz RF Exposure, explained in *RF Exposure Policies and Procedures: TCB Workshop – October 2020*, the testing has been performed on SAR following IEC/IEEE 62209-1528:2020 and then on Power Density for the highest SAR test configurations.

The testing has been performed on all positions (except back face) in both chains and the four considered bands. U-NII-5, U-NII-6, U-NII-7 and U-NII-8 in SAR mode. The back face position and the worst case configuration, identified during the SAR testing, were tested in Power Density mode. This worst case, in addition with back face position, was tested in Power Density mode for Chain B.

Considering the antenna location diagrams in Annex F and the test exclusions described before, the surfaces/edges to be measured for each antenna are:

Antenna	Chain A	Chain B
Position	• Front face • Top edge • Bottom edge • Left edge • Right edge	• Front face • Top edge • Bottom edge • Left edge • Right edge

See *F.2 SAR/PD Test* positions section for more information on the tested positions

C.1.2 Test signal, Output power and Test Frequencies

For 802.11 transmission modes the device was put into operation by using an own control software to program the test mode required to select the continuous transmission with 100% duty cycle.

The output power of the device was set to transmit at maximum power for all tests.

C.2 Conducted Power Measurements

C.2.1 WLAN 6-7GHz (U-NII)

C.2.1.1 6.2GHz (U-NII-5)

					Chain A/Tx1		Chain B/Tx2		
Band	Mode	Data Rate	Ch #	Freq (MHz)	Avg Pwr (dBm)	Tune-up Pwr (dBm)	Avg Pwr (dBm)	Tune-up Pwr (dBm)	SAR Test?
U-NII-5	802.11ax	20	1	5955	NR	7.00	NR	7.00	No
	802.11ax	20	45	6175		7.00		7.00	
	802.11ax	20	93	6415		7.00		7.00	
	802.11ax	40	3	5985		10.00		10.00	
	802.11ax	40	43	6165		10.00		10.00	
	802.11ax	40	91	6405		10.00		10.00	
	802.11ax	80	7	5985		13.00		13.00	
	802.11ax	80	39	6145		13.00		13.00	
	802.11ax	80	87	6385		13.00		13.00	
	802.11ax	160	15	6025	13.48	13.50	13.47	13.50	Yes
	802.11ax	160	47	6185	13.27	13.50	13.17	13.50	No
	802.11ax	160	79	6345	13.47	13.50	13.34	13.50	Yes

Initial test configuration

1. NR: Not Required

C.2.1.2 6.5GHz (U-NII-6)

					Chain A/Tx1		Chain B/Tx2		
Band	Mode	Data Rate	Ch #	Freq (MHz)	Avg Pwr (dBm)	Tune-up Pwr (dBm)	Avg Pwr (dBm)	Tune-up Pwr (dBm)	SAR Test?
U-NII-6	802.11ax	20	97	6435	NR	7.00	NR	7.00	No
		20	105	6475		7.00		7.00	
		20	113	6515		7.00		7.00	
	802.11ax	40	99	6445		10.00		10.00	
		40	107	6485		10.00		10.00	
	802.11ax	80	103	6465		13.00		13.00	
		80	119	6545		13.00		13.00	
	802.11ax	160	111	6505	13.43	13.50	13.35	13.50	Yes

Initial test configuration

1. NR: Not Required

C.2.1.3 6.7GHz (U-NII-7)

					Chain A/Tx1		Chain B/Tx2		
Band	Mode	Data Rate	Ch #	Freq (MHz)	Avg Pwr (dBm)	Tune-up Pwr (dBm)	Avg Pwr (dBm)	Tune-up Pwr (dBm)	SAR Test?
U-NII-7	802.11ax	20	117	6535	NR	7.00	NR	7.00	No
		20	149	6695		7.00		7.00	
		20	181	6855		7.00		7.00	
	802.11ax	40	115	6525		10.00		10.00	
		40	147	6685		10.00		10.00	
		40	179	6845		10.00		10.00	
	802.11ax	80	135	6625		13.00		13.00	
		80	151	6705		13.00		13.00	
		80	167	6785		13.00		13.00	
	802.11ax	160	143	6665	13.37	13.50	13.32	13.50	Yes
		160	175	6825	13.28	13.50	13.30	13.50	No

Initial test configuration

1. NR: Not Required

7.0GHz (U-NII-8)

Band	Mode	Data Rate	Ch #	Freq (MHz)	Chain A/Tx1 Avg Pwr (dBm)	Chain A/Tx1 Tune-up Pwr (dBm)	Chain B/Tx2 Avg Pwr (dBm)	Chain B/Tx2 Tune-up Pwr (dBm)	SAR Test?
U-NII-8	802.11ax	20	185	6875	NR	7.00	NR	7.00	No
		20	209	6995		7.00		7.00	
		20	233	7115		7.00		7.00	
	802.11ax	40	187	6885		10.00		10.00	
		40	227	7085		10.00		10.00	
	802.11ax	80	183	6865		10.00		10.00	
		80	199	6945		13.00		13.00	
		80	215	7025		13.00		13.00	
	802.11ax	160	207	6985	13.49	13.50	13.43	13.05	Yes

Initial test configuration

1. NR: Not Required

C.3 Tissue Parameters Measurement

Head TSL

Freq. (MHz)	Target Parameters		Measured TSL Parameters		Deviation (%)		Date
	ε' (F/m)	σ (S/m)	ε' (F/m)	σ (S/m)	ε'	σ	
6500	34.46	6.07	33.08	6.07	-4.0	0.0	2022-01-17

See *0* for more details.

C.4 System Check Measurements

C.4.1 E-Field

Frequency	Signal Type	Target E-field (V/m)	Measured E-field (V/m)	Deviation (%)	Date
7 GHz	Continuous Wave	52.46	50.27	-4.17	2022-01-18

The E-fields presented in the System Check Measurements table are Peak values. The target E-field value is obtained by simulation. The maximum target E-field value at 10 mm with 10 dBm (10 mW) source power is 52.46 V/m. The maximum measured E-field value at 10 mm with 10 dBm (10 mW) is 50.27 V/m.

C.4.2 H-Field

Frequency	Signal Type	Target H-field (A/m)	Measured H-field (A/m)	Deviation (%)	Date
7 GHz	Continuous Wave	0.13	0.13	0.00	2022-01-18

The H-fields presented in the System Check Measurements table are Peak values. The target H-field value is obtained by simulation. The maximum target H-field value at 10 mm with 10 dBm (10 mW) source power is 0.13 A/m. The maximum measured E-field value at 10 mm with 10 dBm (10 mW) is 0.13 A/m.

C.4.3 Local Power Density

Frequency	Signal Type	Target Local Power Density (W/m2)	Measured Local Power Density (W/m2)	Deviation (%)	Date
7 GHz	Continuous Wave	3.45	3.28	-4.92	2022-01-18

The Local Power Density presented in the System Check Measurements table are Peak values. The target Local Power Density value is obtained by simulation. The maximum target Local Power Density value at 10 mm with 10 dBm (10 mW) source power is 3.45 W/m^2. The maximum measured E-field value at 10 mm with 10 dBm (10 mW) is 3.28 W/m^2.

C.4.4 Averaged Power Density

Frequency	Signal Type	Target Spatially Averaged Power Density (W/m2)	Measured Spatially Averaged Power Density (W/m2)	Deviation (%)	Date
6.5 GHz	Continuous Wave	3.31	3.11	-6.04	2022-01-18

The Spatially Averaged Power Density presented in the System Check Measurements table are Peak values. The target Spatially Averaged Power Density value is obtained by simulation. The maximum target Spatially Averaged Power Density value at 10 mm with 10 dBm (10 mW) source power is 3.31 W/m^2. The maximum measured Spatially Averaged Power Density value at 10 mm with 10 dBm (10 mW) is 3.11 W/m^2.

See *Annex D* for more details.

C.4.5 SAR

Head Measurements

Frequency (MHz)	Average	Target SAR (W/Kg)	Measured SAR (W/Kg)	Deviation to target (%)	Limit (%)	Date
6500	1g	291.00	295.77	1.64	±10	2022-01-18
	10g	53.80	55.77	3.66		

C.5 Test Results

C.5.1 SAR - 802.11ax – 6.2 GHz – U-NII-5

Ant.	Mode Data rate	BW (MHz)	Ch #	Freq (MHz)	Position	Correct. Factor (dB)	SAR 1g (W/kg)		SAR 10g (W/kg)	*Estimated epithelial PD (W/m²)		Plot #
							Measured	Reported	Measured	1cm²	4cm²	
Chain A/Tx1	802.11ax	160	15	6025	Front face	0.02	0.47	0.47	0.16			
					Top edge	0.02	0.10	0.10	0.04			
					Bottom Edge	0.02	0.05	0.05	0.02			
					Left edge	0.02	0.11	0.11	0.04			
					Right edge	0.02	0.01	0.00	0.00			
			79	6345	Front face	0.03	0.33	0.33	0.12			
					Top edge	0.03	0.08	0.08	0.03			
					Bottom Edge	0.03	0.06	0.06	0.02			
					Left edge	0.03	0.09	0.09	0.03			
					Right edge	0.03	0.01	0.01	0.01			
Chain B/Tx2	802.11ax	160	15	6025	Front face	0.03	0.47	0.48	0.17	4.74	3.70	**1**
					Top edge	0.03	0.10	0.10	0.04			
					Bottom Edge	0.03	0.06	0.06	0.02			
					Left edge	0.03	0.11	0.11	0.05			
					Right edge	0.03	0.02	0.02	0.01			
			79	6345	Front face	0.16	0.32	0.33	0.12			
					Top edge	0.16	0.07	0.07	0.03			
					Bottom Edge	0.16	0.06	0.07	0.02			
					Left edge	0.16	0.10	0.10	0.04			
					Right edge	0.16	0.02	0.02	0.01			

* For reference purposes only, not specifically for compliance, the estimated absorbed (epithelial) power density derived from the measured SAR is shown

C.5.1 SAR - 802.11ax – 6.5 GHz – U-NII-6

Ant.	Mode Data rate	BW (MHz)	Ch #	Freq (MHz)	Position	Correct. Factor (dB)	SAR 1g (W/kg)		SAR 10g (W/kg)	*Estimated epithelial PD (W/m²)		Plot #
							Measured	Reported	Measured	1cm²	4cm²	
Chain A/Tx1	802.11ax	160	111	6505	Front face	0.07	0.32	0.32	0.11			
					Top edge	0.07	0.07	0.07	0.03			
					Bottom edge	0.07	0.09	0.09	0.03			
					Left edge	0.07	0.10	0.10	0.04			
					Right edge	0.07	0.02	0.02	0.01			
Chain B/Tx2	802.11ax	160	111	6505	Front face	0.15	0.37	0.38	0.13	3.71	3.02	**2**
					Top edge	0.15	0.08	0.08	0.03			
					Bottom edge	0.15	0.08	0.09	0.03			
					Left edge	0.15	0.09	0.10	0.04			
					Right edge	0.15	0.02	0.02	0.01			

* For reference purposes only, not specifically for compliance, the estimated absorbed (epithelial) power density derived from the measured SAR is shown

C.5.1 SAR - 802.11ax – 6.7 GHz – U-NII-7

Ant.	Mode Data rate	BW (MHz)	Ch #	Freq (MHz)	Position	Correct. Factor (dB)	SAR 1g (W/kg)		SAR 10g (W/kg)	*Estimated epithelial PD (W/m²)		Plot #
							Measured	Reported	Measured	1cm²	4cm²	
Chain A/Tx1	802.11ax	160	143	6665	Front face	0.13	0.32	0.33	0.11			
					Top edge	0.13	0.06	0.06	0.02			
					Bottom edge	0.13	0.11	0.12	0.04			
					Left edge	0.13	0.09	0.10	0.03			
					Right edge	0.13	0.03	0.04	0.01			
Chain B/Tx2	802.11ax	160	143	6665	Front face	0.18	0.32	0.33	0.11	3.15	2.46	**3**
					Top edge	0.18	0.08	0.09	0.03			
					Bottom edge	0.18	0.10	0.10	0.04			
					Left edge	0.18	0.07	0.07	0.02			
					Right edge	0.18	0.03	0.03	0.01			

* For reference purposes only, not specifically for compliance, the estimated absorbed (epithelial) power density derived from the measured SAR is shown

C.5.1 SAR - 802.11ax – 7.0 GHz – U-NII-8

Ant.	Mode Data rate	BW (MHz)	Ch #	Freq (MHz)	Position	Correct. Factor (dB)	SAR 1g (W/kg)		SAR 10g (W/kg)	*Estimated epithelial PD (W/m^2)		Plot #
							Measured	Reported	Measured	$1cm^2$	$4cm^2$	
Chain A/Tx1	802.11ax	160	207	6985	Front face	0.01	0.34	0.34	0.12			
					Top edge	0.01	0.11	0.11	0.04			
					Bottom edge	0.01	0.12	0.12	0.04			
					Left edge	0.01	0.08	0.08	0.03			
					Right edge	0.01	0.03	0.03	0.01			
Chain B/Tx2	802.11ax	160	207	6985	Front face	0.07	0.34	0.35	0.12	3.41	2.62	**4**
					Top edge	0.07	0.15	0.15	0.06			
					Bottom edge	0.07	0.12	0.12	0.04			
					Left edge	0.07	0.08	0.09	0.03			
					Right edge	0.07	0.04	0.04	0.02			

* For reference purposes only, not specifically for compliance, the estimated absorbed (epithelial) power density derived from the measured SAR is shown

C.5.2 Power Density - 802.11ax – 6.2 GHz – U-NII-5

Ant.	Mode Data rate	BW (MHz)	Ch #	Freq (MHz)	Position	PStot avg [W/m^2] 1cm^2	PStot avg [W/m^2] 4cm^2	EM E [V/m]	EM H [A/m]	Plot #
Chain B/Tx2	802.11ax	160	15	6025	Front face	6.49	4.58	96.30	0.26	**5**
					Back Face	0.69	0.65	27.50	0.09	
			79	6345	Front face	5.34	3.96	86.50	0.22	
					Back Face	0.92	0.83	32.40	0.11	

C.5.3 Power Density - 802.11ax – 6.5 GHz – U-NII-6

Ant.	Mode Data rate	BW (MHz)	Ch #	Freq (MHz)	Position	PStot avg [W/m^2] 1cm^2	PStot avg [W/m^2] 4cm^2	EM E [V/m]	EM H [A/m]	Plot #
Chain B/Tx2	802.11ax	160	111	6505	Front face	5.95	3.94	79.20	0.26	**6**
					Back Face	0.74	0.64	29.00	0.08	

C.5.4 Power Density - 802.11ax – 6.7 GHz – U-NII-7

Ant.	Mode Data rate	BW (MHz)	Ch #	Freq (MHz)	Position	PStot avg [W/m^2] 1cm^2	PStot avg [W/m^2] 4cm^2	EM E [V/m]	EM H [A/m]	Plot #
Chain B/Tx2	802.11ax	160	143	6665	Front face	5.03	3.76	73.10	0.21	**7**
					Back Face	1.05	0.88	30.70	0.09	

C.5.5 Power Density - 802.11ax – 7.0 GHz – U-NII-8

Ant.	Mode Data rate	BW (MHz)	Ch #	Freq (MHz)	Position	PStot avg [W/m^2] 1cm^2	PStot avg [W/m^2] 4cm^2	EM E [V/m]	EM H [A/m]	Plot #
Chain B/Tx2	802.11ax	160	207	6985	Front face	3.95	3.06	67.60	0.24	**8**
					Back Face	1.01	0.79	35.20	0.11	

C.5.6 Measurement Variability

According to FCC OET KDB 865664, SAR Measurement variability is assessed when the maximum initial measured SAR is >=0.8 W/kg for a certain band/mode.

As all measured values are under both limits, no variability is required

C.5.7 Simultaneous Transmission Evaluation – SAR

According to FCC OET KDB 447498 D01, when the sum of 1g SAR for all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration.

All the values stated in the table below are the worst case found for standalone measurement with disregard of the transmission mode or channel where the worst case was found

Antenna	Position	Highest Reported SAR (1g) (W/Kg)	
		WLAN 6GHz	Bluetooth*
Chain A/Tx1	Front face	0.47	0.07
Chain B/Tx2	Front face	0.48	

* For Bluetooth values refer to test report 201120-03.TR09 - FCC-ISED, WLAN LOW SKU, AX211D2W

Position	Simultaneous Tx Antenna Combination		Σ SAR 1g (W/kg)	Limit (W/kg)
	Chain A	Chain B		
Front Face	WLAN 6GHz	WLAN 6GHz	0.95	1.6
	WLAN 6GHz + BT	WLAN 6GHz	1.02	
	BT	WLAN 6GHz	0.55	

Considering the results described above and according to the simultaneous transmission SAR test exclusion considerations described in FCC OET KDB 447498 D01, no SAR to Peak Location Separation Ratio is required.

Annex D. Test System Plots

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1. U-NII-5 - 802.11ax, CH15, Chain B/Tx2 – Front Face (SAR)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
AX211D2W, Intel	86.0 x 52.0 x 8.0	D8F8834E4CF1	Module + PIFA Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	FRONT, 5.00	U-NII-5	WLAN, 10755-AAC	6025.0, 15	5.2	5.48	33.9

Hardware Setup

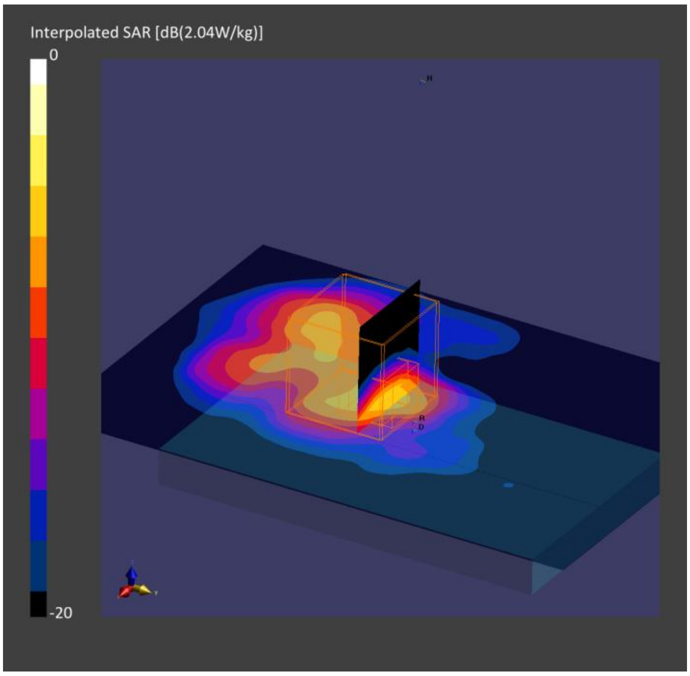
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt)	HBBL-600-10000, 2022-Jan-17	EX3DV4 - SN7455, 2021-03-19	DAE4 Sn1517, 2021-03-11

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 119.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Confirmed by MAIA	Confirmed by MAIA
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-01-18, 11:49	2022-01-18, 12:02
psSAR1g [W/Kg]	0.446	0.474
psSAR10g [W/Kg]	0.155	0.165
Power Drift [dB]	0.12	-0.11
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	Positive Only	Positive Only



2. U-NII-6 - 802.11ax, CH111, Chain B/Tx2 – Front Face (SAR)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
AX211D2W, Intel	86.0 x 52.0 x 8.0	D8F8834E4CF1	Module + PIFA Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	FRONT, 5.00	U-NII-6	WLAN, 10755-AAC	6505.0, 111	5.2	6.07	33.1

Hardware Setup

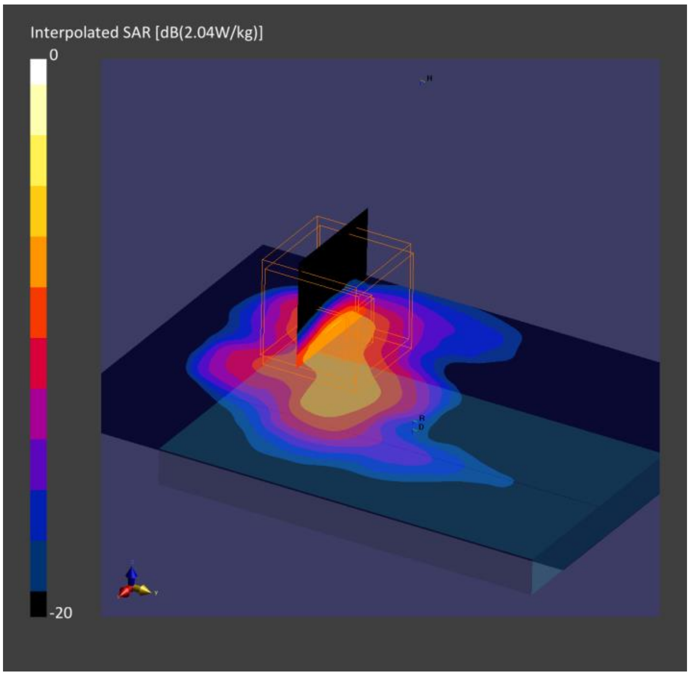
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt)	HBBL-600-10000,2022-Jan-17	EX3DV4 - SN7455, 2021-03-19	DAE4 Sn1517, 2021-03-11

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 119.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Confirmed by MAIA	Confirmed by MAIA
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-01-18, 13:08	2022-01-18, 13:20
psSAR1g [W/Kg]	0.344	0.371
psSAR10g [W/Kg]	0.127	0.134
Power Drift [dB]	0.21	0.00
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	Positive Only	Positive Only



3. U-NII-7 - 802.11ax, CH143, Chain B/Tx2 – Front Face (SAR)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
AX211D2W, Intel	86.0 x 52.0 x 8.0	D8F8834E4CF1	Module + PIFA Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	FRONT, 5.00	U-NII-7	WLAN, 10755-AAC	6665.0, 143	5.2	6.28	32.8

Hardware Setup

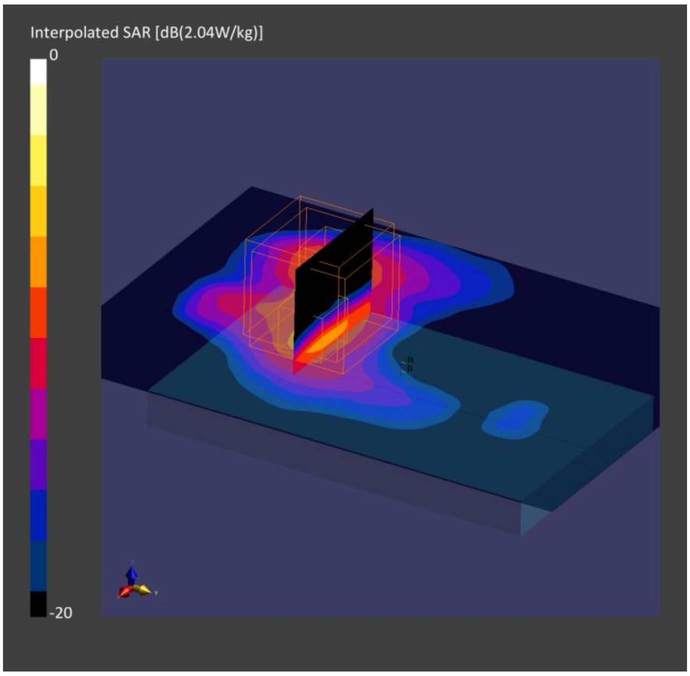
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt)	HBBL-600-10000, 2022-Jan-17	EX3DV4 - SN7455, 2021-03-19	DAE4 Sn1517, 2021-03-11

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 119.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Confirmed by MAIA	Confirmed by MAIA
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-01-18, 13:49	2022-01-18, 14:02
psSAR1g [W/Kg]	0.295	0.315
psSAR10g [W/Kg]	0.111	0.110
Power Drift [dB]	0.18	-0.06
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	Positive Only	Positive Only



4. U-NII-8 - 802.11ax, CH207, Chain B/Tx2 – Front Face (SAR)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
AX211D2W, Intel	86.0 x 52.0 x 8.0	D8F8834E4CF1	Module + PIFA Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	FRONT, 5.00	U-NII-8	WLAN, 10755-AAC	6985.0, 207	5.2	6.66	32.3

Hardware Setup

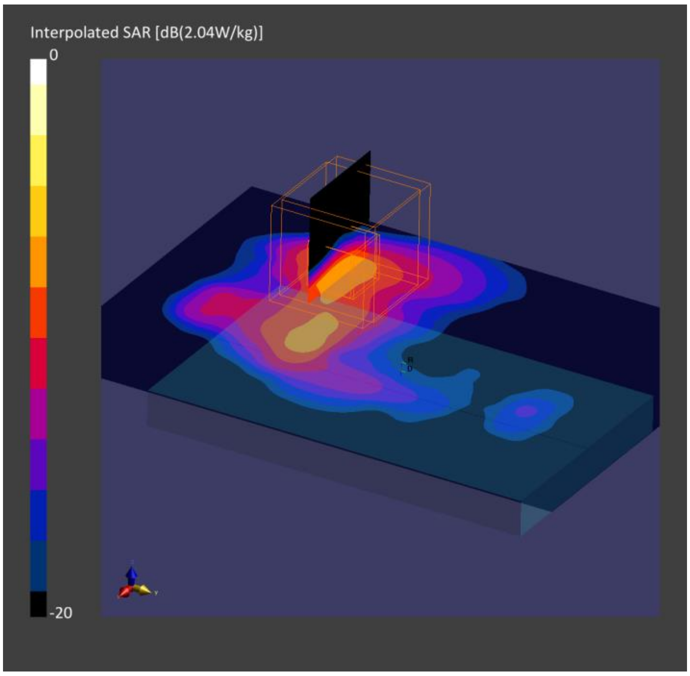
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt)	HBBL-600-10000, 2022-Jan-17	EX3DV4 - SN7455, 2021-03-19	DAE4 Sn1517, 2021-03-11

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 119.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Confirmed by MAIA	Confirmed by MAIA
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-01-18, 14:34	2022-01-18, 14:45
psSAR1g [W/Kg]	0.331	0.341
psSAR10g [W/Kg]	0.116	0.115
Power Drift [dB]	-0.21	-0.07
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	Positive Only	Positive Only



5. U-NII-5 - 802.11ax, CH15, Chain B/Tx2 – Front Face (PD)

DUT: AX211D2W Module + PIFA Antenna; Type: WRF-BR-PIFA-V3.2

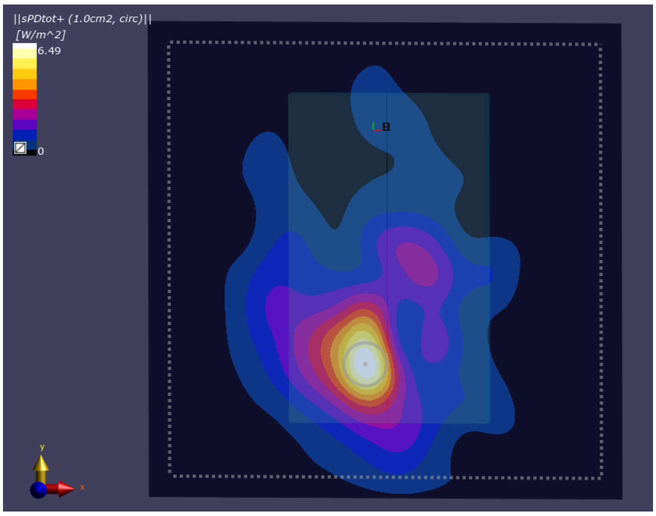
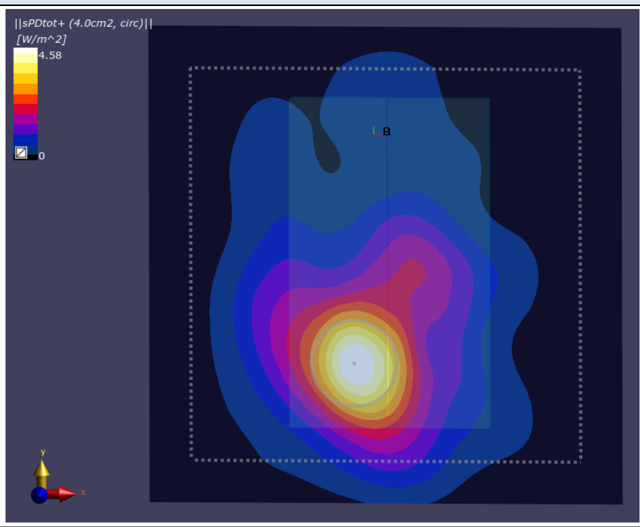
Signal Source: modulation Custom Channel for 802.11ax, level 13.50 dBm.

Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: Table Section
Measurement Standard: DASY6 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EUmmW - SN9538; ConvF(1, 1, 1); Calibrated: 2021-05-20;
    - Modulation Compensation:
- Sensor-Surface : 0mm (Fix Surface), z = 5 mm
- Electronics: DAE4 Sn1517; Calibrated: 2021-03-11;
- Phantom: Cover; Type: SPEAG Phantom Cover;
- cDASY6 5G Module v2.4.0.55
- Test Date: 2022-01-18

Distance-5mm:
Measurement Resolution = λ/6 mm
Measurement Scan area = 120 mm x 120 mm
The plots below show the average PStot (1cm^2), PStot (4cm^2) the E-field and the H Field

<table>
<tr><th colspan="2">Measurement Results</th></tr>
<tr><th>PStot (1cm^2)</th><th>PStot (4cm^2)</th></tr>
<tr><td>
</td><td>
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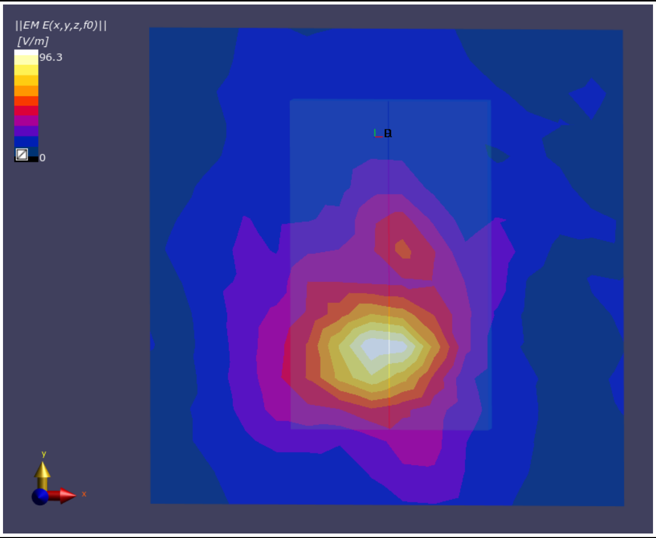
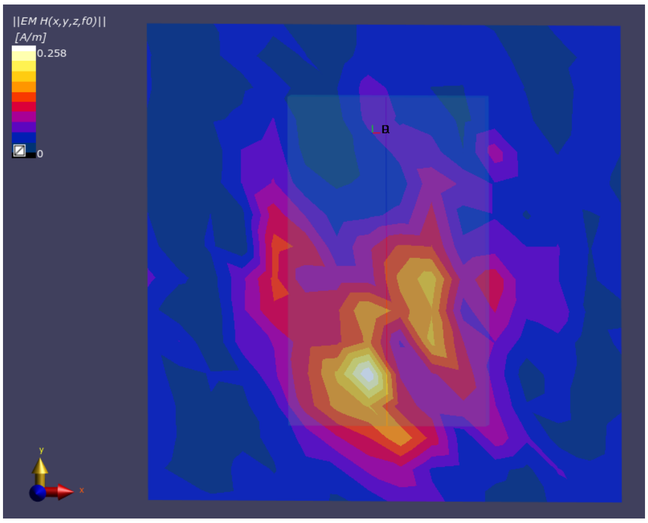
<tr><td>
</td><td>
</td></tr>
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6. U-NII-6 - 802.11ax, CH111, Chain B/Tx2 – Front Face (PD)

DUT: AX211D2W Module + PIFA Antenna; Type: WRF-BR-PIFA-V3.2

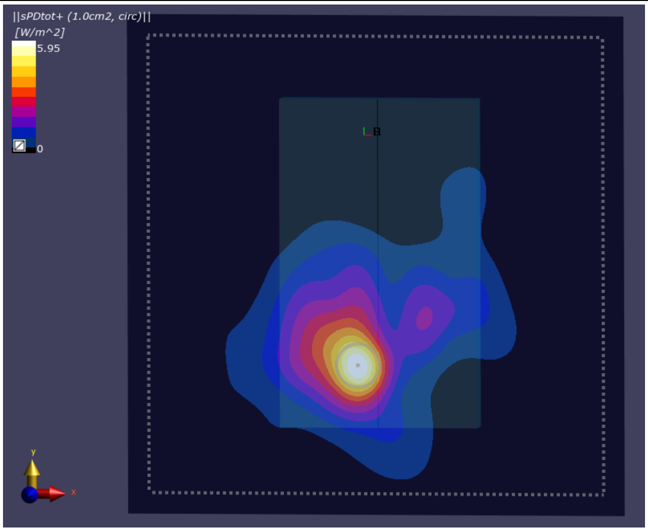
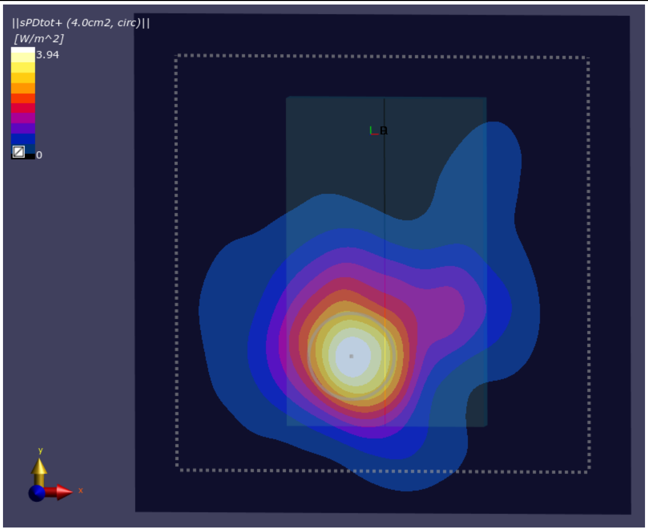
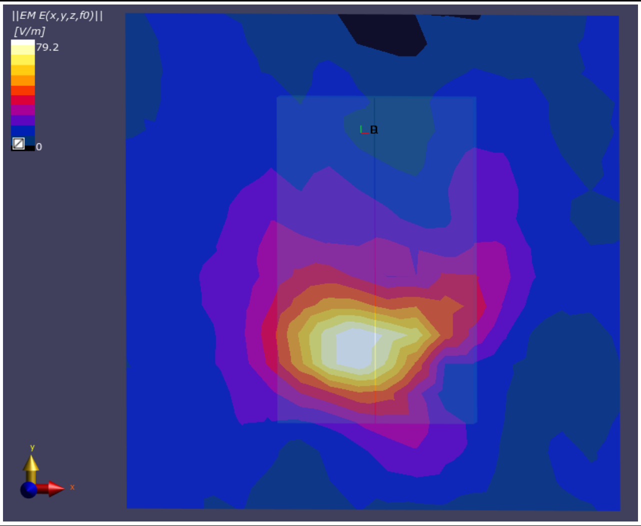
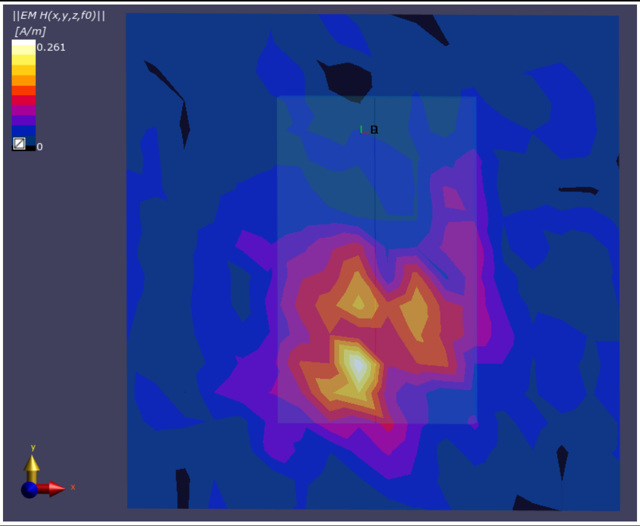
Signal Source: modulation Custom Channel for 802.11ax, level 13.50 dBm.

Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: Table Section
Measurement Standard: DASY6 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EUmmW - SN9538; ConvF(1, 1, 1); Calibrated: 2021-05-20;
  - Modulation Compensation:
- Sensor-Surface : 0mm (Fix Surface), z = 5 mm
- Electronics: DAE4 Sn1517; Calibrated: 2021-03-11;
- Phantom: Cover; Type: SPEAG Phantom Cover;
- cDASY6 5G Module v2.4.0.55
- Test Date: 2022-01-18

Distance-5mm:
Measurement Resolution = λ/6 mm
Measurement Scan area = 120 mm x 120 mm
The plots below show the average PStot (1cm^2), PStot (4cm^2) the E-field and the H Field

Measurement Results	
PStot (1cm^2)	PStot (4cm^2)
	
E-field	H Field
	

7. U-NII-7 - 802.11ax, CH143, Chain B/Tx2 – Front Face (PD)

DUT: AX211D2W Module + PIFA Antenna; Type: WRF-BR-PIFA-V3.2

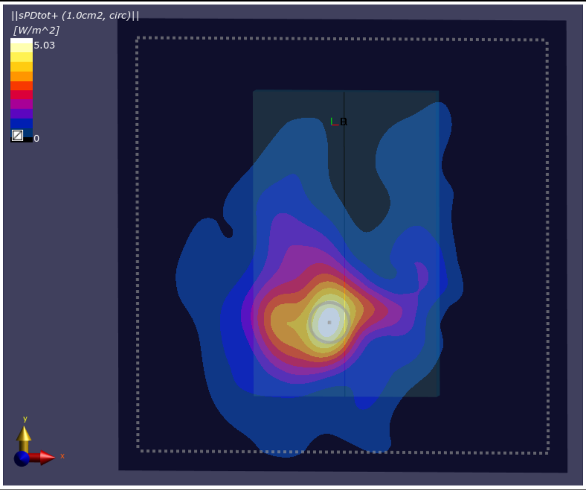
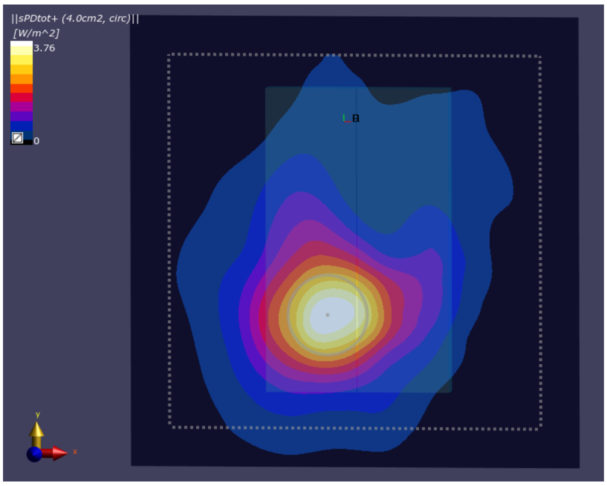
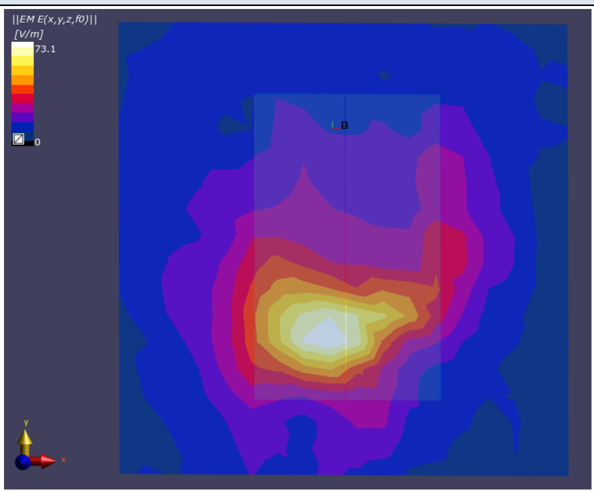
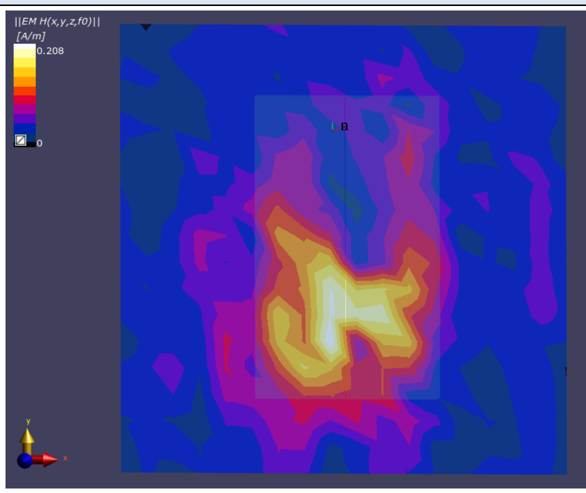
Signal Source: modulation Custom Channel for 802.11ax, level 13.50 dBm.

Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: Table Section
Measurement Standard: DASY6 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EUmmW - SN9538; ConvF(1, 1, 1); Calibrated: 2021-05-20;
  - Modulation Compensation:
- Sensor-Surface : 0mm (Fix Surface), z = 5 mm
- Electronics: DAE4 Sn1517; Calibrated: 2021-03-11;
- Phantom: Cover; Type: SPEAG Phantom Cover;
- cDASY6 5G Module v2.4.0.55
- Test Date: 2022-01-18

Distance-5mm:
Measurement Resolution = λ/6 mm
Measurement Scan area = 120 mm x 120 mm
The plots below show the average PStot (1cm^2), PStot (4cm^2) the E-field and the H Field

Measurement Results	
PStot (1cm^2)	PStot (4cm^2)
	
E-field	H Field
	

8. U-NII-8 - 802.11ax, CH207, Chain B/Tx2 – Front Face (PD)

DUT: AX211D2W Module + PIFA Antenna; Type: WRF-BR-PIFA-V3.2

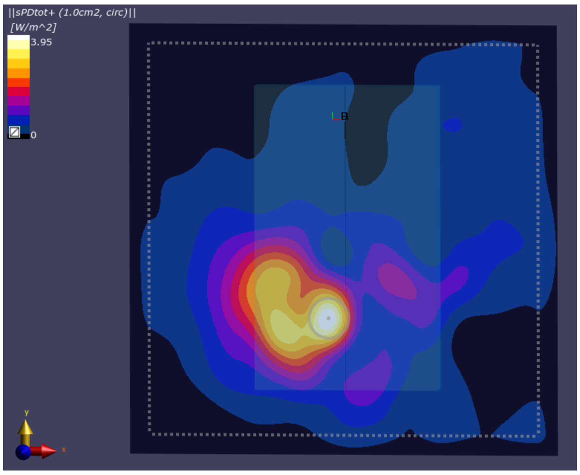
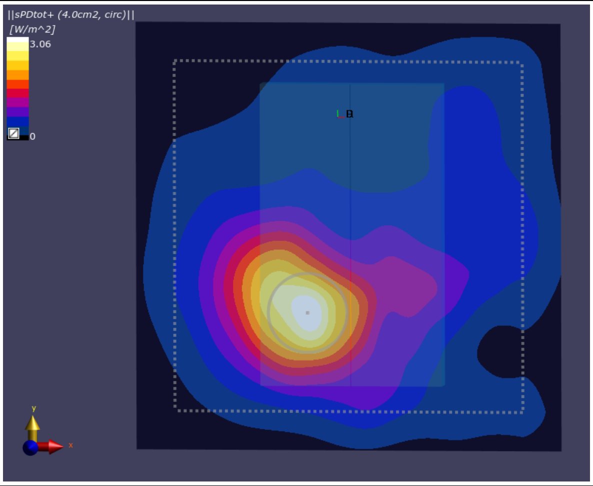
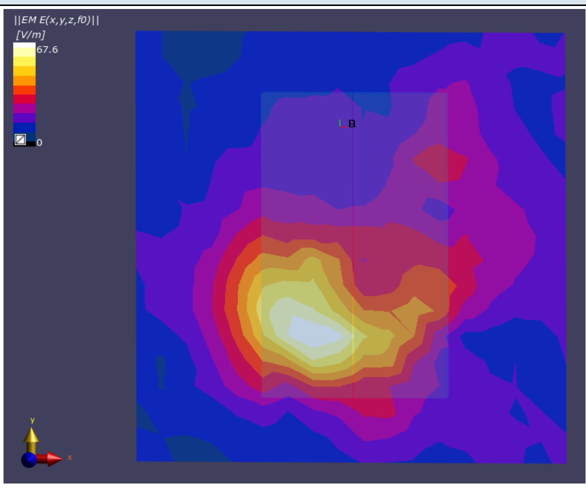
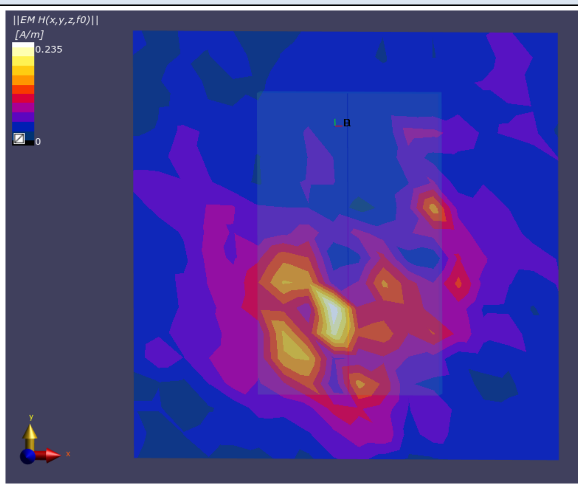
Signal Source: modulation Custom Channel for 802.11ax, level 13.50 dBm.

Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: Table Section
Measurement Standard: DASY6 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EUmmW - SN9538; ConvF(1, 1, 1); Calibrated: 2021-05-20;
    - Modulation Compensation:
- Sensor-Surface : 0mm (Fix Surface), z = 5 mm
- Electronics: DAE4 Sn1517; Calibrated: 2021-03-11;
- Phantom: Cover; Type: SPEAG Phantom Cover;
- cDASY6 5G Module v2.4.0.55
- Test Date: 2022-01-18

Distance-5mm:
Measurement Resolution = λ/6 mm
Measurement Scan area = 120 mm x 120 mm
The plots below show the average PStot (1cm^2), PStot (4cm^2) the E-field and the H Field

Measurement Results	
PStot (1cm^2)	PStot (4cm^2)
	
E-field	H Field
	

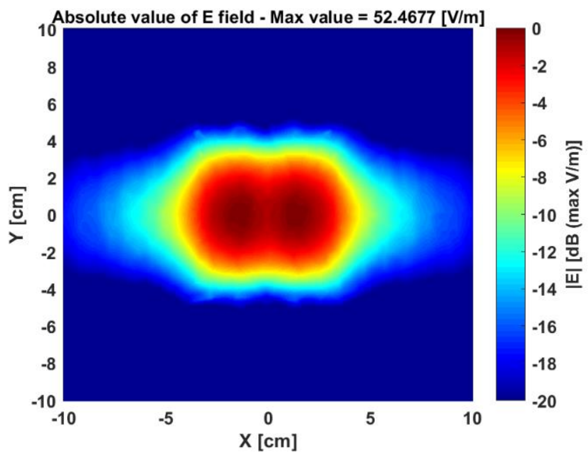
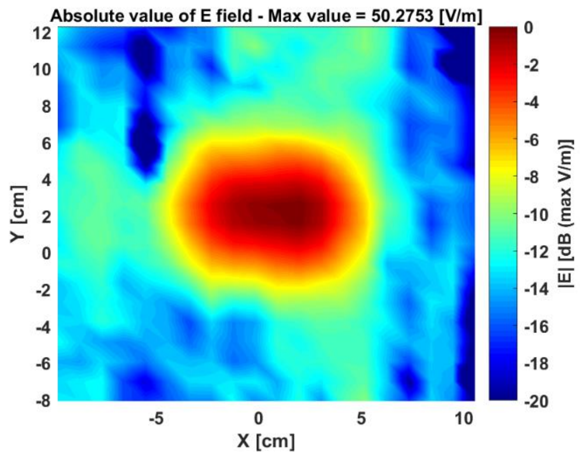
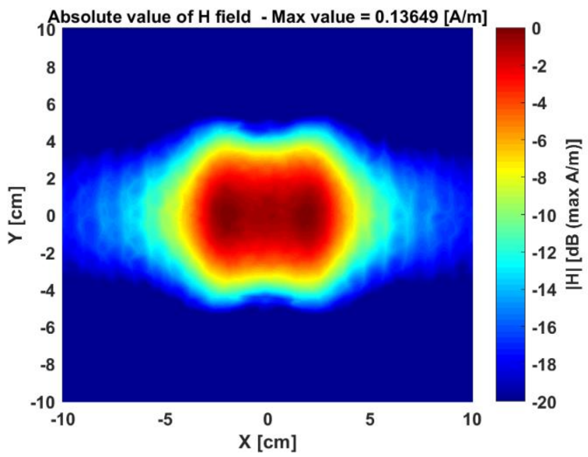
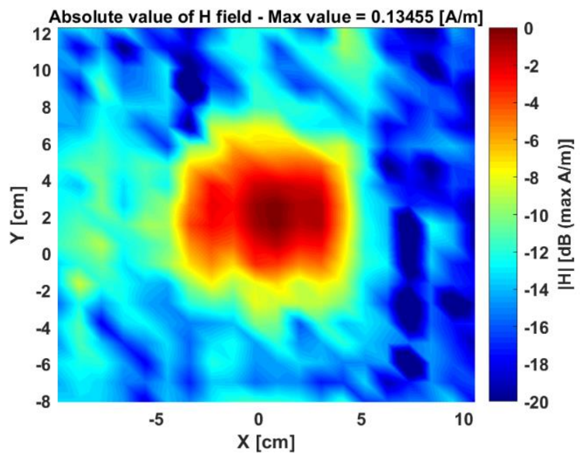
9. Power Density System Check 7000MHz

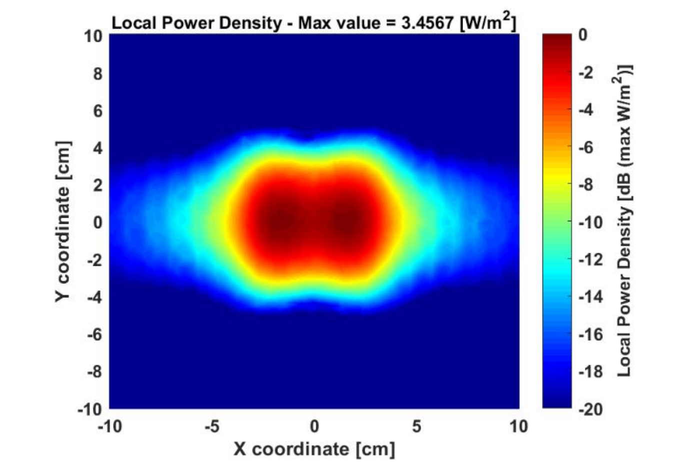
DUT: Horn reference source; Type: PE9859/SF-15;
Signal Source: modulation CW, level 10 dBm.
Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: Table Section
Measurement Standard: DASY6 (IEEE/IEC/ANSI C63.19-2011)
DASY Configuration:

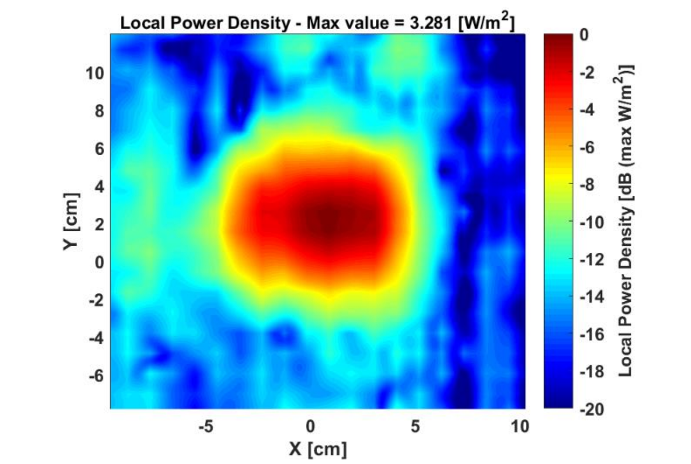
- Probe: EUmmW - SN9538; ConvF(1, 1, 1); Calibrated: 2021-05-20;
    - Modulation Compensation:
- Sensor-Surface : 0mm (Fix Surface), z = 10 mm
- Electronics: DAE4 Sn1517; Calibrated: 2021-03-11;
- Phantom: Cover; Type: SPEAG Phantom Cover;
- cDASY6 5G Module v2.4.0.55;
- Test Date: 2022-01-18

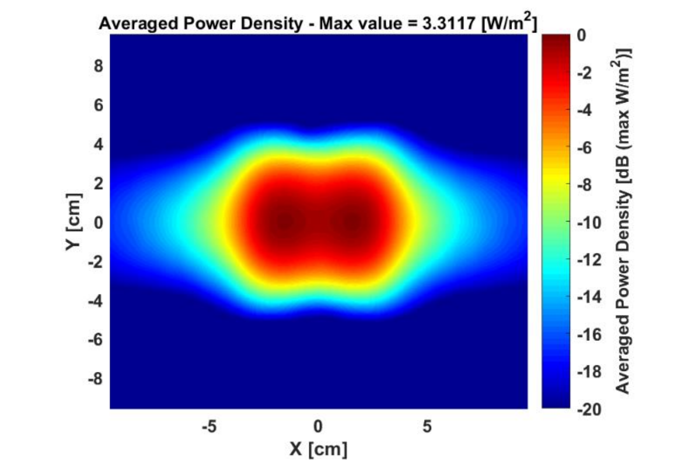
Distance-10mm/Measure Horn reference source (86.9x63.5):
Measurement Resolution = λ/4 mm
Measurement Scan area = 200 mm x 200 mm

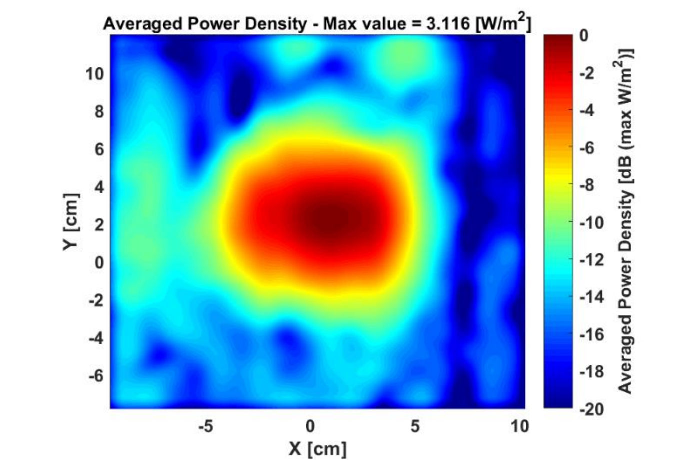
The plots below show the comparison between the Numerical Modeling results and the system check measurement results in terms of E-field, H Field, single point power density and Avg Power density 1cm^2.

Numerical Modeling Results	Measurement Results
	
	

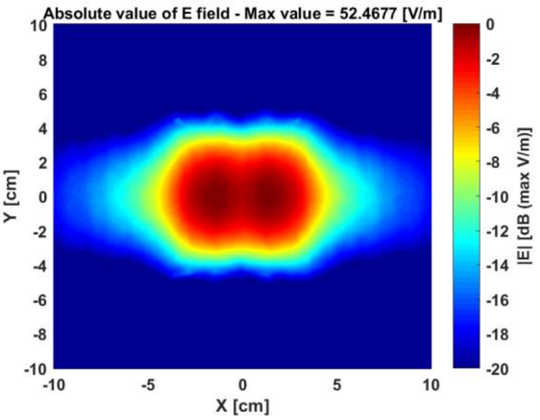
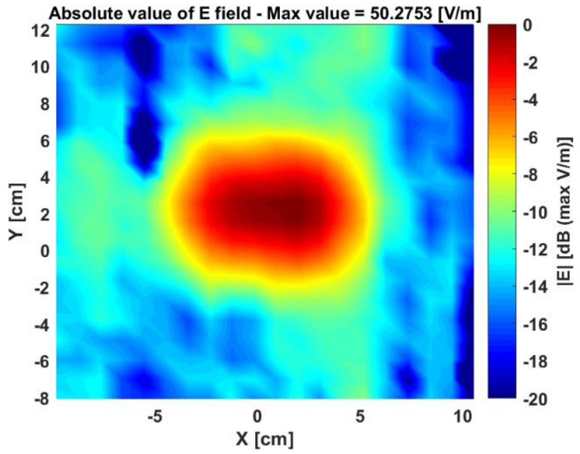
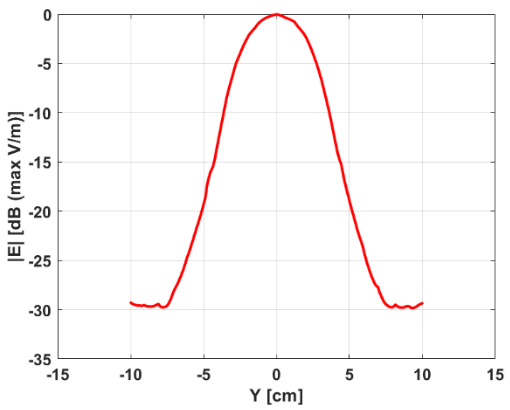
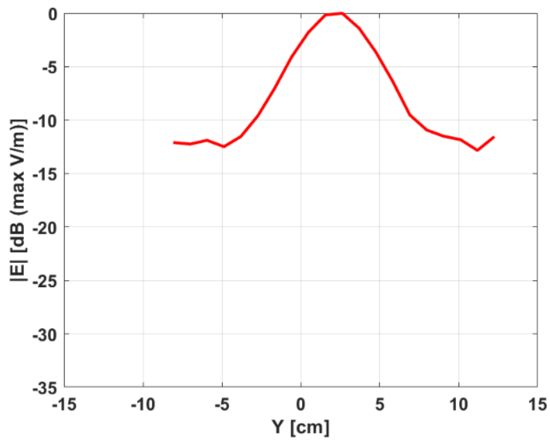
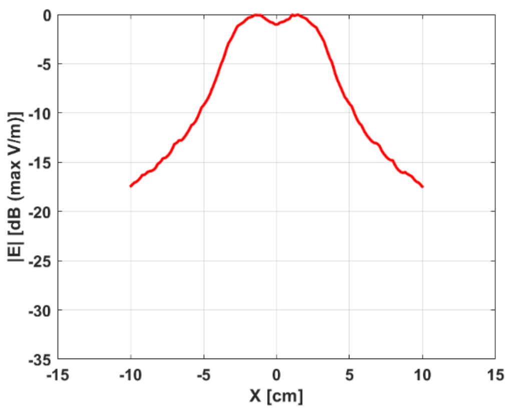
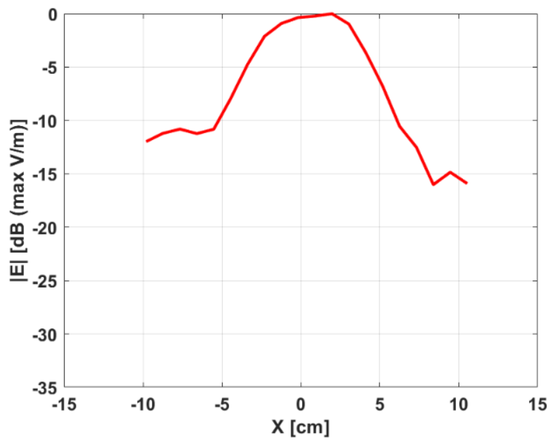

Local Power Density - Max value = 3.4567 [W/m2]
Y coordinate [cm]
X coordinate [cm]
Local Power Density [dB (max W/m2)]


Local Power Density - Max value = 3.281 [W/m2]
Y [cm]
X [cm]
Local Power Density [dB (max W/m2)]


Averaged Power Density - Max value = 3.3117 [W/m2]
Y [cm]
X [cm]
Averaged Power Density [dB (max W/m2)]


Averaged Power Density - Max value = 3.116 [W/m2]
Y [cm]
X [cm]
Averaged Power Density [dB (max W/m2)]

The plots below show the comparison between the numerical modeling and the system check results in terms of normalized E-field distribution and the 1D variation along the two axis of the maximum.

<table>
<tr><td>Numerical Modeling Results
- scan area: 200 mm x 200 mm
- Resolution: 0.5 mm</td><td>System Check Measurement Results
- scan area: 200 mm x 200 mm
- Resolution: λ/4 mm</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">Field variation through the maximum along the E-field polarization</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">Field variation through the maximum along the H-field polarization</td></tr>
<tr><td>
</td><td>
</td></tr>
</table>

10. SAR System Check 6500MHz

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
D6.5GHzV2, SPEAG	50.0 x 10.0 x 8.0	1013	Validation Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	,		, 0--	6500.0, 0	5.2	6.07	33.1

Hardware Setup

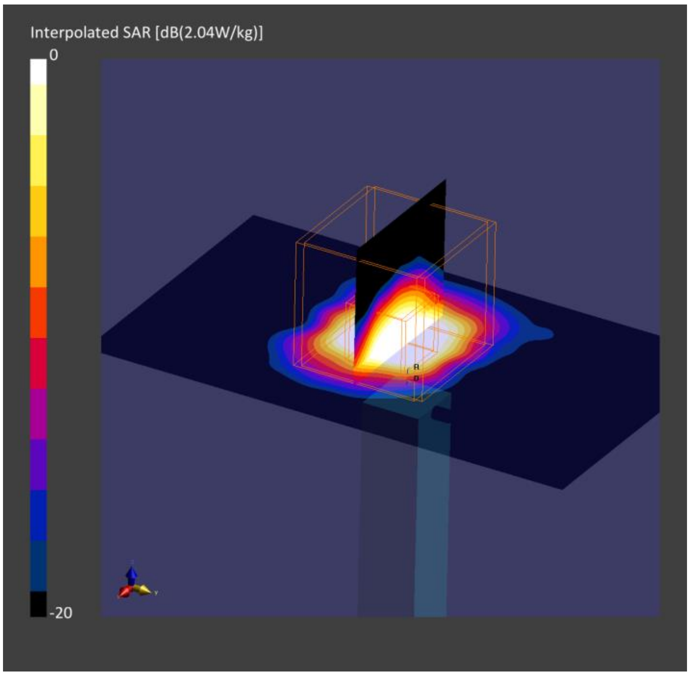
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt)	HBBL-600-10000, 2022-Jan-17	EX3DV4 - SN7455, 2021-03-19	DAE4 Sn1517, 2021-03-11

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	51.0 x 85.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Confirmed by MAIA	Confirmed by MAIA
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-01-18, 16:44	2022-01-18, 16:55
psSAR1g [W/Kg]	2.53	3.15
psSAR10g [W/Kg]	0.584	0.594
Power Drift [dB]	0.01	0.04
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	Positive Only	Positive Only

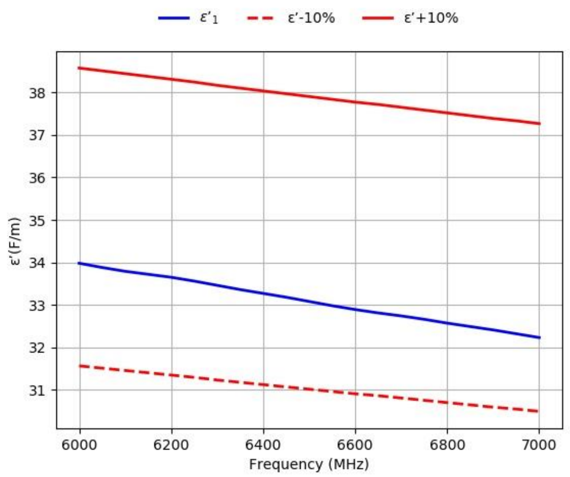


TSL Dielectric Parameters

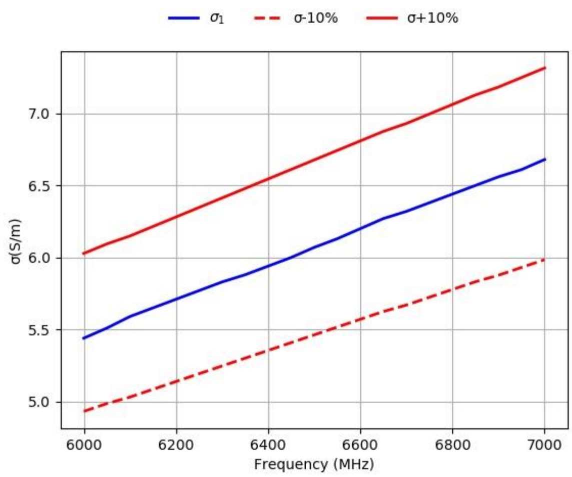
D.1 Head WiFi 6E 6500MHz

Freq.(MHz)	Target		Measured 2022-01-17	
	ε'(F/m)	σ(S/m)	ε'1(F/m)	σ1(S/m)
6000.0	35.07	5.48	33.98	5.44
6050.0	35.01	5.54	33.88	5.51
6100.0	34.95	5.59	33.79	5.59
6150.0	34.89	5.65	33.72	5.65
6200.0	34.83	5.71	33.65	5.71
6250.0	34.77	5.77	33.56	5.77
6300.0	34.7	5.83	33.46	5.83
6350.0	34.64	5.89	33.36	5.88
6400.0	34.58	5.95	33.27	5.94
6450.0	34.52	6.01	33.18	6.0
6500.0	34.46	6.07	33.08	6.07
6550.0	34.4	6.13	32.98	6.13
6600.0	34.34	6.19	32.89	6.2
6650.0	34.29	6.25	32.81	6.27
6700.0	34.23	6.3	32.74	6.32
6750.0	34.17	6.36	32.66	6.38
6800.0	34.11	6.42	32.57	6.44
6850.0	34.05	6.48	32.49	6.5
6900.0	33.99	6.53	32.41	6.56
6950.0	33.94	6.59	32.32	6.61
7000.0	33.88	6.65	32.23	6.68

Permittivity



Conductivity



Annex E. Calibration Certificates

ID	Device	Type/Model	Serial Number	Manufacturer	Calibration Certificate
443-000	E-field Probe	EUmmWV2	9538	SPEAG	
086-000	Dosimetric E-field Probe	EX3DV4	7455	SPEAG	
096-000	6500MHz System Validation Dipole	D6.5GHzV2	1013	SPEAG	

Dipole calibration

According to the KDB 865664 D01, a dipole must be calibrated using a fully validated SAR system according to the tissue dielectric parameters and SAR probe calibration frequency required for device testing. However, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements.
The test laboratory must ensure that the required supporting information and documentation are included in the SAR report to qualify for the three-year extended calibration interval; otherwise, the IEEE Std 1528-2013 recommended annual calibration applies.
Immediate re-calibration is required for the following conditions:

1. When the most recent return-loss result, measured at least annually, deviates by less than 20% from the previous measurement (i.e. value in dB × 0.2) and meeting the required 20 dB minimum return-loss requirement.

2. When the most recent measurement of the real and imaginary parts of the impedance, measured at least annually, deviates by less than 5 Ohms from the previous measurement.

Dipole ID #096-000			
Dipole 6500MHz Head TSL			
	Return Loss [dB]	Impedance [Ω]	Date
Initial Calibration	-24.5	49.4 - 5.9 j	2020-08-25
Last calibration	-27.2	49.8 - 4.4 j	2021-09-10