

ELEMENT MATERIALS TECHNOLOGY

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RF EXPOSURE PART 0 TEST REPORT

Applicant Name:

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Gyeonggi-do, 16677, Korea

Date of Testing:

05/05/2025 – 06/02/2025

Test Site/Location:

Element, Columbia, MD, USA

Document Serial No.:

1M2504220043-05.A3L

FCC ID:

A3LSMF966U

APPLICANT:

SAMSUNG ELECTRONICS CO., LTD

Report Type:

Part 0 SAR Characterization

DUT Type:

Portable Handset

Model(s):

SM-F966U

Additional Model:

SM-F966U1

Only operations relevant to this permissive change were evaluated for compliance. Please see the original compliance evaluation in RF Exposure Technical Report S/N 1M2502210015-02.A3L for complete evaluation of all other operating modes. The operational description includes a description of all changed items.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Test results reported herein relate only to the item(s) tested.

RJ Ortanez
Executive Vice President



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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26	Voice/Data	814.7 - 848.3 MHz
LTE Band 5	Voice/Data	824.7 - 848.3 MHz
LTE Band 66	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n14	Voice/Data	790.5 - 795.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n70	Voice/Data	1697.5 - 1707.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n78	Voice/Data	3455.01 - 3544.98 MHz; 3705 - 3795 MHz
NR Band n77	Voice/Data	3455.01 - 3544.98 MHz; 3705 - 3975 MHz
NTN Band 255	Data	1629 - 1658 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
2.4 GHz WIFI	Voice/Data	2412 - 2462 MHz
5 GHz WIFI	Voice/Data	U-NII-1: 5180 - 5240 MHz U-NII-2A: 5260 - 5320 MHz U-NII-2C: 5500 - 5720 MHz U-NII-3: 5745 - 5825 MHz U-NII-4: 5845 - 5885 MHz
6 GHz WIFI	Voice/Data	U-NII-5: 5935 - 6415 MHz U-NII-6: 6435 - 6515 MHz U-NII-7: 6535 - 6875 MHz U-NII-8: 6895 - 7115 MHz
2.4 GHz Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
UWB	Data	6489.6 - 7987.2 MHz

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1.2 Time-Averaging for SAR and Power Density

This device is enabled with Qualcomm® Gen2 Smart Transmit algorithm to control and manage transmitting power in real time and to ensure that the time-averaged RF exposure from 2G/3G/4G/5G Sub-6 NR WWAN and WLAN/BT is in compliance with FCC requirements. This Part 0 report shows SAR characterization of WWAN radios for 2G/3G/4G/5G Sub-6 NR and WLAN/BT radios. Characterization is achieved by determining P_{Limit} for 2G/3G/4G/5G Sub-6 NR/WLAN/BT that corresponds to the exposure design targets after accounting for all device design related uncertainties, i.e., SAR_{design_target} (< FCC SAR limit) for sub-6 radio. The SAR characterization is denoted as SAR Char in this report. Section 1.3 includes a nomenclature of the specific terms used in this report.

The compliance test under the static transmission scenario and simultaneous transmission analysis are reported in Part 1 report. The validation of the time-averaging algorithm and compliance under the dynamic (time-varying) transmission scenario for WWAN/WLAN/BT technologies are reported in Part 2 report (report SN could be found in Section 1.4 – Bibliography).

1.3 Nomenclature for Part 0 Report

Technology	Term	Description
2G/3G/4G/5G Sub-6 NR/WLAN/BT	P_{limit}	Power level that corresponds to the exposure design target (SAR_{design_target}) after accounting for all device design related uncertainties
	P_{max}	Maximum tune up output power
	SAR_{design_target}	Target SAR level < FCC SAR limit after accounting for all device design related uncertainties
	SAR_{Char}	Table containing P_{limit} for all technologies and bands

1.4 Bibliography

Report Type	Report Serial Number
RF Exposure Part 1 Test Original Report	1M2502210015-01.A3L
RF Exposure Part 2 Test Original Report	1M2502210015-03.A3L
PD Part 1 Test Original Report	1M2502210015-04.A3L
PD Part 0 Test Original Report	
RF Exposure Original Compliance Summary	1M2502210015-05.A3L
RF Exposure Part 1 Report	1M2504220043-04.A3L

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2.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 2-1).

Equation 2-1
SAR Mathematical Equation

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

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

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

where:

σ	=	conductivity of the tissue-simulating material (S/m)
ρ	=	mass density of the tissue-simulating material (kg/m ³)
E	=	Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

2.2 SAR Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 2-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 2-1) and IEEE 1528-2013. On the

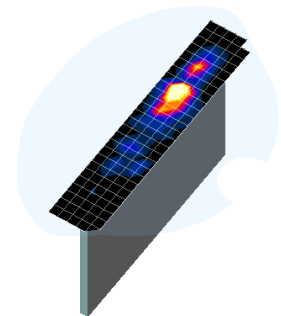


Figure 2-1
Sample SAR Area Scan

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basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 2-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).

b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.

c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

Table 2-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*

Frequency	Maximum Area Scan Resolution (mm) ($\Delta x_{\text{area}}, \Delta y_{\text{area}}$)	Maximum Zoom Scan Resolution (mm) ($\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$)	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
				$\Delta z_{\text{zoom}}(n)$	$\Delta z_{\text{zoom}}(1)^*$	
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≤ 4	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 22

*Also compliant to IEEE 1528-2013 Table 6

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3 SAR CHARACTERIZATION

3.1 DSI and SAR Determination

This device uses different Device State Index (DSI) to configure different time averaged power levels based on certain exposure scenarios. Depending on the detection scheme implemented in the smartphone, the worst-case SAR was determined by measurements for the relevant exposure conditions for that DSI. Detailed descriptions of the detection mechanisms are included in the operational description.

When 1g SAR and 10g SAR exposure comparison is needed, the worst-case was determined from SAR normalized to 1g or 10g SAR limit.

The device state index (DSI) conditions used in Table 3-1 represent different exposure scenarios.

Table 3-1
DSI and Corresponding Exposure Scenarios

Scenario	Description	SAR Test Cases
Body– Folder Open (DSI = 0)	- Device is held with hand and grip sensor is not triggered - Distance grip sensor not triggered - Folder Open	<i>Tablet SAR per KDB 616217 D04v01r02</i>
Body Grip – Folder Open (DSI = 4)	- Device is held with hand and grip sensor is triggered - Grip sensor active - Folder Open	<i>Tablet SAR per KDB 616217 D04v01r02</i>
Head – Folder Closed (DSI = 3)	- Device positioned next to head - Receiver Active - Folder Closed	<i>Head SAR per KDB Publication 648474 D04</i>
Body-worn – Folder Closed (DSI = 1)	- Device being used with a body-worn accessory - Folder Closed	<i>Body-worn SAR per KDB Publication 648474 D04</i>
Hotspot mode – Folder Closed (DSI = 1)	- Device transmits in hotspot mode near body - Hotspot Mode Active - Folder Closed	<i>Hotspot SAR per KDB Publication 941225 D06</i>
Phablet Grip – Folder Closed (DSI=5)	- Device is held with hand and grip sensor is triggered - Grip sensor is active - Folder Closed	<i>Phablet SAR per KDB Publication 648474 D04 & KDB Publication 616217 D04</i>

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3.2 SAR Design Target

SAR_design_target is determined by ensuring that it is less than FCC SAR limit after accounting for total device designed related uncertainties specified by the manufacturer (see Table 3-2).

Table 3-2
***SAR_design_target* Calculations**

<i>SAR_design_target</i>			
$SAR_design_target < SAR_regulatory_limit \times 10^{\frac{-Total\ Uncertainty}{10}}$			
1g SAR (W/kg)		10g SAR (W/kg)	
<i>Total Uncertainty</i>	1.0 dB	<i>Total Uncertainty</i>	1.0 dB
<i>SAR_regulatory_limit</i>	1.6 W/kg	<i>SAR_regulatory_limit</i>	4.0 W/kg
<i>SAR_design_target</i>	1.0 W/kg	<i>SAR_design_target</i>	2.5 W/kg

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3.3 SAR Char

SAR test results corresponding to P_{max} for each antenna/technology/band/DSI can be found in Appendix A.

P_{limit} is calculated by linearly scaling with the measured SAR at the P_{part0} to correspond to the SAR_{design_target} . When $P_{limit} < P_{max}$, P_{part0} was used as P_{limit} in the Smart Transmit EFS. When $P_{limit} > P_{max}$ and $P_{part0}=P_{max}$, calculated P_{limit} was used in the Smart Transmit EFS. All reported SAR obtained from the P_{part0} SAR tests was less than $SAR_{Design_target}+ 1$ dB Uncertainty. The final P_{limit} determination for each exposure scenario corresponding to SAR_{design_target} are shown in Table 3-3.

Table 3-3
 P_{Limit} Determination

Device State Index (DSI)	P_{Limit} Determination Scenarios
0	The worst-case SAR exposure is determined as maximum SAR normalized to the limit (i.e. lowest p_{limit}) among: 1. For bands on antenna G, body SAR measured at 10 mm for back, 13 mm for top, and 0 mm for bottom, right, and left. 2. For all other bands, body SAR measured at 0 mm for all surfaces.
1	The worst-case SAR exposure is determined as maximum SAR normalized to the limit (i.e. lowest p_{limit}) among: 1. Body-worn SAR 2. Hotspot SAR at 10mm 3. Extremity SAR measured at 0 mm spacing for back, front, top, bottom, right, and left
3	P_{limit} is calculated based on 1g Head SAR
4	P_{limit} is calculated based on 1g Body SAR at 0 mm
5	P_{limit} is calculated based on 10g Extremity SAR at 0 mm for all surfaces

Notes:

- When $P_{max} < P_{limit}$ EFS, the DUT will operate at a power level up to P_{max}
- All P_{limit} EFS and maximum tune up output power P_{max} levels entered in above Table correspond to average power levels after accounting for duty cycle in the case of TDD, GMSK, or OFDM modulation schemes (e.g. GSM, LTE TDD and WLAN/BT).
- Maximum tune up output power P_{max} is used to configure EUT during RF tune up procedure. The maximum allowed output power is equal to maximum Tune up output power + 1dB device design uncertainty.
- As part of this permissive change, the EFS P_{limit} for LTE 30 and NR N66 of DSI 3 with Antenna B were reduced (while remaining above P_{max}) to ensure continued compliance with simultaneous transmission SAR requirements. Conducted power levels and SAR test data remain unchanged.

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Table 3-4
SAR Characterizations

Exposure Scenario			Maximum Tune-Up Output Power*	F/O Body	F/C Body	F/C Head	F/O Grip	F/C Grip
Averaging Volume				1g	1g/10g	1g	1g	10g
Spacing				13mm, 10mm, 0mm	10mm, 5mm, 0mm	0mm	0mm	0mm
DSI				0	1	3	4	5
Technology/Band	Antenna	Antenna Group	P _{max}	P _{limit}	P _{limit}	P _{limit}	P _{limit}	P _{limit}
LTE Band 66/4	G	AG1	24.5	21.0	17.0	19.5	11.0	17.0
LTE Band 25/2	G	AG1	24.0	21.0	17.0	19.5	10.5	17.0
LTE Band 30	B	AG0	24.0	11.0	19.0	30.9	11.0	19.0
LTE Band 30	G	AG1	23.5	21.0	18.0	18.5	9.5	18.0
LTE Band 7	G	AG1	24.0	17.5	16.5	17.0	9.0	16.5
LTE Band 41/38	G	AG1	22.0	19.0	16.5	16.0	9.0	16.5
NR Band n70	G	AG1	23.5	21.0	17.0	19.0	11.0	17.0
NR Band n66	B	AG0	24.0	12.0	18.0	30.8	12.0	18.0
NR Band n66	G	AG1	24.0	21.0	17.0	19.5	11.0	17.0
NR Band n25/n2	G	AG1	24.0	21.0	17.0	19.5	10.5	17.0
NR Band n30	G	AG1	23.0	21.0	18.0	18.5	9.5	18.0
NR Band n7	G	AG1	23.0	17.5	16.5	17.0	9.0	16.5
NR Band n41 PC3 (Path 1)	G	AG1	24.0	19.0	16.5	16.0	9.0	16.5
NR Band n41 PC3 (Path 1)	B	AG0	20.0	11.0	17.5	20.0	11.0	17.5
NR Band n41 PC3 (Path 1)	H	AG1	20.5	7.0	14.0	14.0	7.0	14.0
NR Band n41 PC3 (Path 1)	D	AG0	18.5	7.0	14.0	14.0	7.0	14.0
NR Band n41 PC2 (Path 1)	G	AG1	26.0	19.0	16.5	16.0	9.0	16.5
NR Band n41 PC2 (Path 1)	B	AG0	20.0	11.0	17.5	20.0	11.0	17.5
NR Band n41 PC2 (Path 1)	H	AG1	20.5	7.0	14.0	14.0	7.0	14.0
NR Band n41 PC2 (Path 1)	D	AG0	18.5	7.0	14.0	14.0	7.0	14.0
NR Band n41 PC1.5 UL-MIMO	G	AG1	26.0	19.0	16.5	16.0	9.0	16.5
NR Band n38 (Path 1)	G	AG1	24.0	19.0	16.5	16.0	9.0	16.5

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EQUIPMENT LIST

For SAR measurements

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4404B	Spectrum Analyzer	N/A	N/A	N/A	MY45113242
Agilent	E4438C	ESG Vector Signal Generator	10/23/2024	Annual	10/23/2025	MY45093852
Agilent	E4438C	ESG Vector Signal Generator	11/15/2024	Annual	11/15/2025	MY45093078
Agilent	N5182A	MMG Vector Signal Generator	7/9/2024	Annual	7/9/2025	MY45180366
Agilent	8753ES	S-Parameter Vector Network Analyzer	1/6/2025	Annual	1/6/2026	MY40001472
Agilent	8753ES	S-Parameter Vector Network Analyzer	9/25/2024	Annual	9/25/2025	MY40003841
Agilent	E5515C	Wireless Communications Test Set	CBT	N/A	CBT	GB46310798
Agilent	E5515C	Wireless Communications Test Set	CBT	N/A	CBT	GB41450275
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433973
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433974
Amplifier Research	150A100C	Amplifier	CBT	N/A	CBT	350132
Anritsu	MN8110B	I/O Adaptor	CBT	N/A	CBT	6261747881
Anritsu	ML2496A	Power Meter	7/15/2024	Annual	7/15/2025	1138001
Anritsu	ML2496A	Power Meter	6/24/2024	Annual	6/24/2025	1840005
Anritsu	MA2411B	Pulse Power Sensor	9/5/2024	Annual	9/5/2025	1726262
Anritsu	MA2411B	Pulse Power Sensor	10/21/2024	Annual	10/21/2025	1027293
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	CBT	N/A	CBT	6200901190
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	CBT	N/A	CBT	6201144419
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	3/14/2025	Annual	3/14/2026	6262044715
Anritsu	MT8000A	Radio Communication Test Station	CBT	N/A	CBT	626196-7072
Anritsu	MT8000A	Radio Communication Test Station	CBT	N/A	CBT	6272337408
Anritsu	MT8000A	Radio Communication Test Station	CBT	N/A	CBT	6262036828
Anritsu	MT8000A	Radio Communication Test Station	4/11/2025	Annual	4/11/2026	6261987983
Anritsu	MT8000A	Radio Communication Test Station	3/11/2025	Annual	3/11/2026	6272337439
Anritsu	MT8000A	Radio Communication Test Station	11/12/2024	Annual	11/12/2025	6272337405
Anritsu	MA24106A	USB Power Sensor	7/10/2024	Annual	7/10/2025	1827530
Anritsu	MA24106A	USB Power Sensor	10/29/2024	Annual	10/29/2025	1248508
Mini-Circuits	PWR-4GHS	USB Power Sensor	6/12/2024	Annual	6/12/2025	12001070013
Control Company	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	240174346
Control Company	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	240171096
Control Company	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	240171059
Control Company	4040	Therm./ Clock/ Humidity Monitor	4/15/2024	Biennial	4/15/2026	240310280
Control Company	4040	Therm./ Clock/ Humidity Monitor	4/15/2024	Biennial	4/15/2026	240310282
Control Company	S66279	Therm./ Clock/ Humidity Monitor	2/16/2024	Biennial	2/16/2026	240140051
Keysight Technologies	N9020A	MXA Signal Analyzer	7/8/2024	Annual	7/8/2025	MY48010233
Agilent	N9020A	MXA Signal Analyzer	6/14/2024	Annual	6/14/2025	MY56407002
MCL	BW-NGW5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	VLF-6000+	Low Pass Filter DC to 6000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	VLF-6000+	Low Pass Filter DC to 6000 MHz	7/10/2024	Annual	7/10/2025	31634
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	ZUDC10-83-5+	Directional Coupler	CBT	N/A	CBT	2050
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-53W2	Attenuator (3dB)	CBT	N/A	CBT	120
Seekonk	NC-100	Torque Wrench	CBT	N/A	CBT	22217
Seekonk	NC-100	Torque Wrench	4/2/2024	Biennial	4/2/2026	1262
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	CBT	N/A	CBT	120504
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	CBT	N/A	CBT	109366
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	CBT	N/A	CBT	155128
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	CBT	N/A	CBT	102060
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	CBT	N/A	CBT	167112
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	CBT	N/A	CBT	168544
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	1/10/2025	Annual	1/10/2026	131453
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	7/8/2024	Annual	7/8/2025	166818
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	4/8/2025	Annual	4/8/2026	151849
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	8/12/2024	Annual	8/12/2025	171008
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/23/2024	Annual	10/23/2025	170999
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	8/27/2024	Biennial	8/27/2026	167085
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/11/2024	Annual	10/11/2025	168729
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	7/19/2024	Annual	7/19/2025	171001
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	6/11/2024	Annual	6/11/2025	166869
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	6/10/2024	Annual	6/10/2025	168543
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	4/7/2025	Annual	4/7/2026	167284
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	1/28/2025	Annual	1/28/2026	135400
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	1/25/2025	Annual	1/25/2026	122206
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	12/10/2024	Annual	12/10/2025	167286
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	1/6/2025	Annual	1/6/2026	131454
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	4/9/2025	Annual	4/9/2026	145663
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	9/26/2024	Biennial	9/26/2026	110553
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/2/2024	Annual	10/2/2025	171000
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	4/3/2025	Annual	4/3/2026	167285
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/22/2025	Annual	2/22/2026	168527
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	1/6/2025	Annual	1/6/2026	150117
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	12/10/2024	Annual	12/10/2025	161616
SPEAG	DAK-3.5	Dielectric Assessment Kit	11/5/2024	Annual	11/5/2025	1277
SPEAG	DAK-3.5	Portable Dielectric Assessment Kit	8/7/2024	Annual	8/7/2025	1041
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1237
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1331
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1390
SPEAG	DAK-12	Dielectric Assessment Kit (4MHz - 3GHz)	3/10/2025	Annual	3/10/2026	1102

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Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
SPEAG	D1640V2	1640 MHz SAR Dipole	12/13/2022	Triennial	10/6/2025	321
SPEAG	D1750V2	1750 MHz SAR Dipole	11/7/2024	Annual	11/7/2025	1150
SPEAG	D1750V2	1750 MHz SAR Dipole	1/13/2025	Annual	1/13/2026	1148
SPEAG	D1900V2	1900 MHz SAR Dipole	2/7/2025	Annual	2/7/2026	5d148
SPEAG	D1900V2	1900 MHz SAR Dipole	8/8/2022	Triennial	8/8/2025	5d080
SPEAG	D2300V2	2300 MHz SAR Dipole	8/25/202	Triennial	8/25/2025	1073
SPEAG	D2300V2	2300 MHz SAR Dipole	6/14/2024	Annual	6/14/2025	1116
SPEAG	D2450V2	2450 MHz SAR Dipole	11/7/2024	Annual	11/7/2025	981
SPEAG	D2450V2	2450 MHz SAR Dipole	8/7/2024	Annual	8/7/2025	719
SPEAG	D2600V2	2600 MHz SAR Dipole	11/15/2022	Triennial	11/15/2025	1071
SPEAG	D2600V2	2600 MHz SAR Dipole	6/13/2022	Triennial	6/13/2025	1064
SPEAG	D2600V2	2600 MHz SAR Dipole	4/8/2024	Annual	4/8/2025	1004
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/4/2024	Annual	12/4/2025	1213
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/10/2025	Annual	4/10/2026	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/8/2024	Annual	7/8/2025	1677
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/7/2025	Annual	4/7/2026	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/11/2025	Annual	3/11/2026	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/8/2024	Annual	7/8/2025	1583
SPEAG	EX3DV4	SAR Probe	3/7/2025	Annual	3/7/2026	7488
SPEAG	EX3DV4	SAR Probe	6/28/2024	Annual	6/28/2025	7803
SPEAG	EX3DV4	SAR Probe	11/11/2024	Annual	11/11/2025	7539
SPEAG	EX3DV4	SAR Probe	7/5/2024	Annual	7/5/2025	7406
SPEAG	EX3DV4	SAR Probe	4/8/2025	Annual	4/8/2026	7718
SPEAG	EX3DV4	SAR Probe	4/7/2025	Annual	4/7/2026	7659
SPEAG	EX3DV4	SAR Probe	12/5/2024	Annual	12/5/2025	7410

Note:

1. CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.
2. Each equipment item was used solely within its respective calibration period.

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MEASUREMENT UNCERTAINTIES

For SAR Measurements

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	ToL (± %)	Prob. Dist.	Div.	c _f 1 gm	c _g 10 gms	1 gm u _f (± %)	10 gms u _g (± %)	v _i
Measurement System									
Probe Calibration	E.2.1	7	N	1	1	1	7.0	7.0	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	0.7	0.7	0.9	0.9	∞
Boundary Effect	E.2.3	2	R	1.732	1	1	1.2	1.2	∞
Linearity	E.2.4	0.3	N	1	1	1	0.3	0.3	∞
System Detection Limits	E.2.4	0.25	R	1.732	1	1	0.1	0.1	∞
Modulation Response	E.2.5	4.8	R	1.732	1	1	2.8	2.8	∞
Readout Electronics	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	R	1.732	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.732	1	1	0.5	0.5	∞
Probe Positioning w/ respect to Phantom	E.6.3	6.7	R	1.732	1	1	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	4	R	1.732	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning	E.4.2	3.12	N	1	1	1	3.1	3.1	35
Device Holder Uncertainty	E.4.1	1.67	N	1	1	1	1.7	1.7	5
Output Power Variation - SAR drift measurement	E.2.9	5	R	1.732	1	1	2.9	2.9	∞
SAR Scaling	E.6.5	0	R	1.732	1	1	0.0	0.0	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	7.6	R	1.73	1.0	1.0	4.4	4.4	∞
Liquid Conductivity - measurement uncertainty	E.3.3	4.3	N	1	0.78	0.71	3.3	3.0	76
Liquid Permittivity - measurement uncertainty	E.3.3	4.2	N	1	0.23	0.26	1.0	1.1	75
Liquid Conductivity - Temperature Uncertainty	E.3.4	3.4	R	1.732	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Uncertainty	E.3.4	0.6	R	1.732	0.23	0.26	0.1	0.1	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Combined Standard Uncertainty (k=1)							RSS	12.2	12.0
Expanded Uncertainty (95% CONFIDENCE LEVEL)							k=2	24.4	24.0

The above measurement uncertainties are according to IEEE Std. 1528-2013

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