

# APPENDIX A: SYSTEM VERIFICATION

## A.1 MAGPy Test System Verification

The system was verified to be within  $\pm 0.35$  dB of the Peak H-field targets and  $\pm 0.32$  dB of the psSAR (1g) targets on the calibration certificate according to the test system specification in the user's manual and calibration facility recommendation. The deviation thresholds represent the expanded uncertainty for system performance checks using SPEAG's WPT verification sources. The same spatial resolution and measurement region used in the source calibration was applied during the system check.

The results from the verification are scaled based on the excitation current in the verification source during calibration. Therefore, the excitation current in the verification source is measured during the verification test. Then, the measured H-field and SAR values are scaled according to the following:

Scaling factor for H-field = (current during calibration)/(current during verification)

Scaling factor for SAR = [(current during calibration)/(current during verification)]<sup>2</sup>

**Table A.1-1  
System Verification Results**

System Verification														
Syst.	Freq. (kHz)	Date	Source SN	Probe SN	Source Current (A)		Peak H-field (A/m)				psSAR 1g avg. (mW/kg)			
					Calibration	Verification	measured (raw)	measured (scaled)	target	Deviation (dB)	measured (raw)	measured (scaled)	target	Deviation (dB)
MAGPy	400	7/21/2022	1012	2051	0.8132	0.8662	268	252	251	0.02	4.21	3.71	3.94	-0.26

## A.2 SAR Test System Verification

**Table A.2-1  
Measured Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, $\sigma$ (S/m)	Measured Dielectric Constant, $\epsilon$	TARGET Conductivity, $\sigma$ (S/m)	TARGET Dielectric Constant, $\epsilon$	% dev $\sigma$	% dev $\epsilon$
7/13/2022	5800 Body	21.5	5800	6.220	46.184	6.000	48.200	3.67%	-4.18%
			5805	6.224	46.181	6.006	48.193	3.63%	-4.17%
			5825	6.238	46.175	6.029	48.166	3.47%	-4.13%
			5835	6.239	46.162	6.042	48.130	3.26%	-4.09%
			5845	6.240	46.161	6.054	48.110	3.07%	-4.05%
			5855	6.247	46.158	6.066	48.093	2.98%	-4.02%
			5865	6.274	46.085	6.077	48.080	3.24%	-4.15%
			5875	6.306	46.027	6.088	48.067	3.58%	-4.24%
			5885	6.336	45.993	6.100	48.053	3.87%	-4.29%
			5905	6.378	45.938	6.122	48.027	4.18%	-4.35%

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

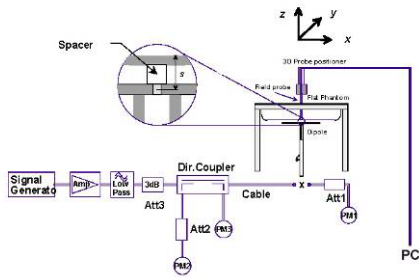
The SAR measurement systems have implemented the SAR error compensation algorithms documented in IEC 62209-2 to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters for all frequencies. The test lab has verified that the required SAR error compensation algorithm has been correctly applied to only scale up the measured SAR, not downward.

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DUT Type: Portable Handset		APPENDIX A: Page 1 of 3

Prior to SAR assessment, the system is verified to  $\pm 10\%$  of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. Full system validation status and result summary can be found in Appendix F.

**Table A.2-2  
System Verification Results**

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR <sub>1g</sub> (W/kg)	1 W Target SAR <sub>1g</sub> (W/kg)	1 W Normalized SAR <sub>1g</sub> (W/kg)	Deviation <sub>1g</sub> (%)
M	5800	BODY	7/13/2022	21.1	21.5	0.050	1057	7551	3.680	74.800	73.600	-1.60%



**Figure A-1  
System Verification Setup Diagram**



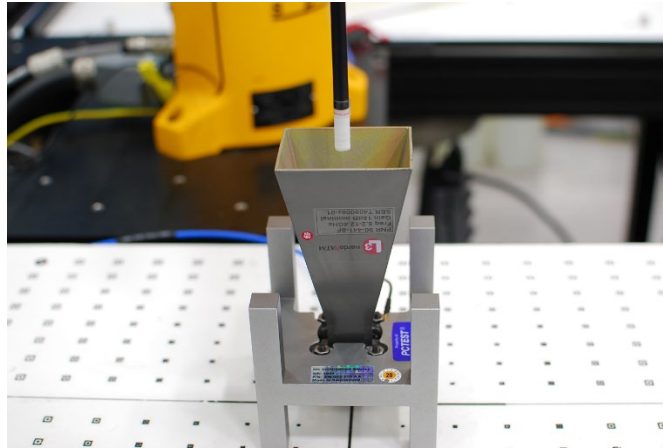
**Figure A-2  
System Verification Setup Photo**

FCC ID: PY7-76056F	FCC URS (UNINTENTIONAL RADIATOR RF SOURCES) RF EXPOSURE EVALUATION	Approved by: Technical Manager
DUT Type: Portable Handset		APPENDIX A: Page 2 of 3

### A.3 Power Density Test System Verification

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

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



**Figure A.3-1  
System Verification Setup Photo**

**Table A.3-1  
10 GHz Verifications**

System Verification											
Syst.	Freq. (GHz)	Date	Source SN	Probe SN	Prad (mW)	Normal psPD (W/m <sup>2</sup> over 4 cm <sup>2</sup> )		Deviation (dB)	Total psPD (W/m <sup>2</sup> over 4 cm <sup>2</sup> )		Deviation (dB)
						measured	target		measured	target	
R	10.00	7/11/2022	9407	1004	86.1	50.00	50.70	-0.06	50.20	50.70	-0.04

Note: A **10 mm distance spacing** was used from the reference horn antenna aperture to the probe element.

FCC ID: PY7-76056F	FCC URS (UNINTENTIONAL RADIATOR RF SOURCES) RF EXPOSURE EVALUATION	Approved by: Technical Manager
DUT Type: Portable Handset		APPENDIX A: Page 3 of 3