

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2550 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.1	1.91 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	37.3 \pm 6 %	1.97 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.8 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	57.8 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	26.5 W/kg \pm 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.6	2.09 mho/m
Measured Body TSL parameters	(22.0 \pm 0.2) °C	51.5 \pm 6 %	2.14 mho/m \pm 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.7 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	54.0 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	24.7 W/kg \pm 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	54.9 Ω - 2.3 j Ω
Return Loss	- 25.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.6 Ω - 2.0 j Ω
Return Loss	- 33.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.151 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 03, 2012

DASY5 Validation Report for Head TSL

Date: 24.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2550 MHz; Type: D2550V2; Serial: D2550V2 - SN:1010

Communication System: UID 0 - CW; Frequency: 2550 MHz

Medium parameters used: $f = 2550$ MHz; $\sigma = 1.97$ S/m; $\epsilon_r = 37.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.43, 7.43, 7.43) @ 2550 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

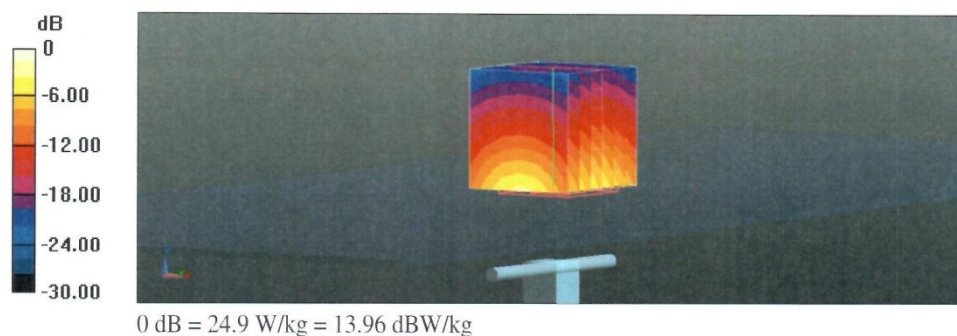
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 119.6 V/m; Power Drift = -0.07 dB

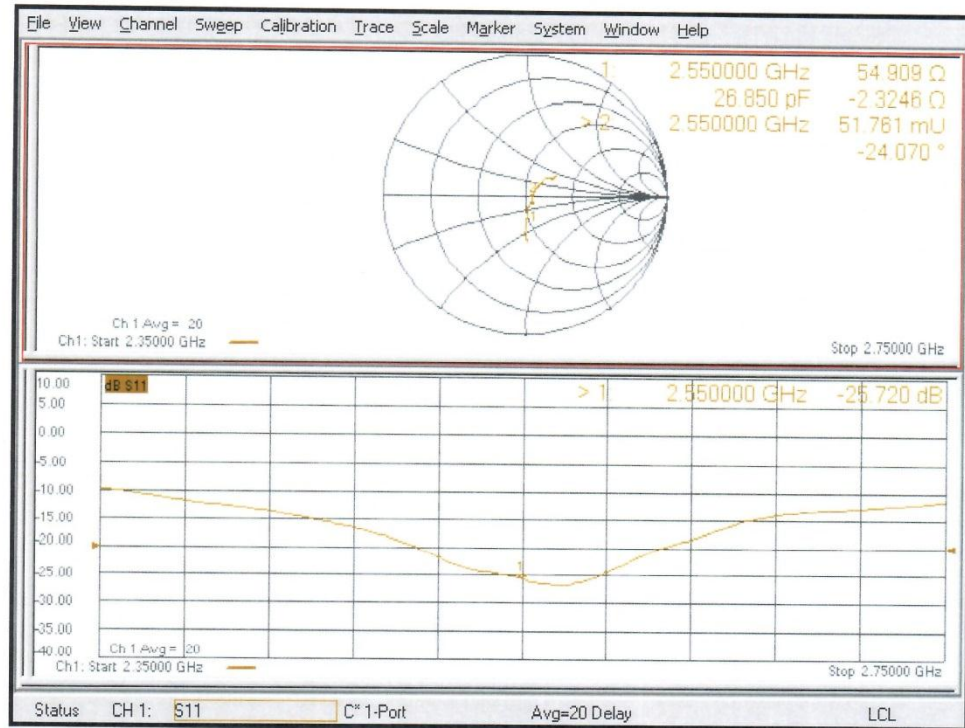
Peak SAR (extrapolated) = 30.5 W/kg

SAR(1 g) = 14.8 W/kg; SAR(10 g) = 6.73 W/kg

Maximum value of SAR (measured) = 24.9 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 24.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2550 MHz; Type: D2550V2; Serial: D2550V2 - SN:1010

Communication System: UID 0 - CW; Frequency: 2550 MHz

Medium parameters used: $f = 2550$ MHz; $\sigma = 2.14$ S/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.68, 7.68, 7.68) @ 2550 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

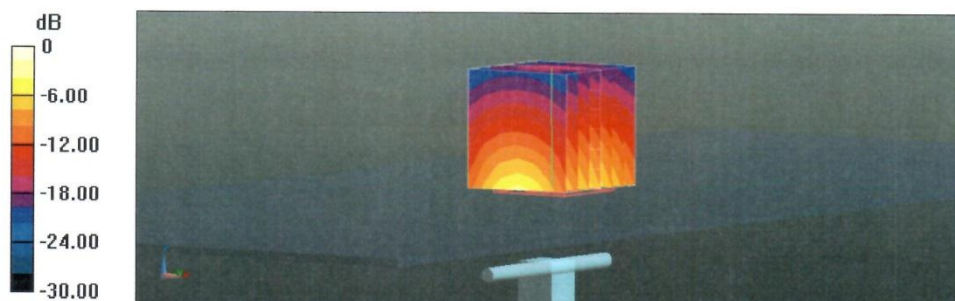
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.2 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.9 W/kg

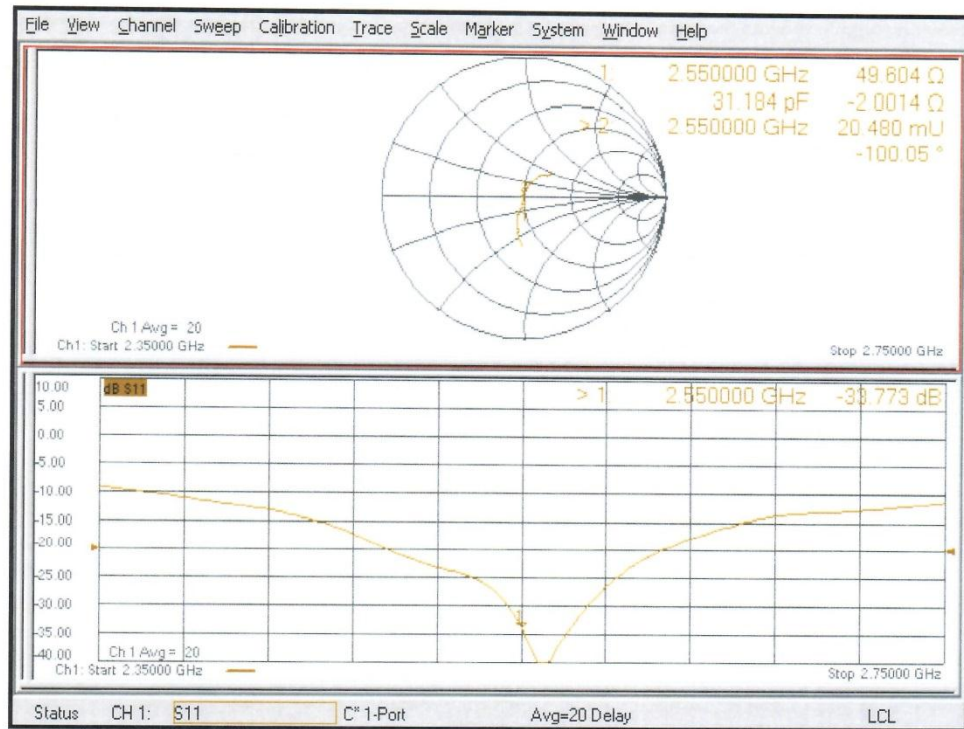
SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.22 W/kg

Maximum value of SAR (measured) = 22.9 W/kg



0 dB = 22.9 W/kg = 13.60 dBW/kg

Impedance Measurement Plot for Body TSL



ANNEX J: Extended Calibration SAR Dipole

Referring to KDB865664 D01, if dipoles are verified in return loss ($< -20\text{dBm}$, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

Justification of Extended Calibration SAR Dipole D835V2– serial no.4d057

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2018-10-09	-27.7	/	49.6	/	-4.08	/
2019-10-06	-26.9	2.9	50.1	0.5	-3.95	0.13
2020-10-05	-25.4	8.3	56.7	1.8	-2.15	0.15

Justification of Extended Calibration SAR Dipole D1900V2– serial no. 5d088

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2018-10-24	-23.2	/	52.7	/	6.63	/
2019-10-22	-22.9	1.3	53.5	0.8	6.86	0.23
2020-10-20	-20.7	10.8	54.4	1.7	6.95	0.32

Justification of Extended Calibration SAR Dipole D2450V2– serial no. 873

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2018-10-26	-28.0	/	53.5	/	2.11	/
2019-10-22	-27.3	2.5	54.4	0.9	2.29	0.18
2020-10-20	-24.9	11.1	55.1	1.6	2.46	0.35

Justification of Extended Calibration SAR Dipole D2550V2– serial no.1010

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2018-08-24	-25.7	/	54.9	/	-2.30	/
2019-08-22	-24.8	3.5	55.8	0.9	-2.22	0.08
2020-08-20	-23.2	9.7	56.4	1.5	-2.13	0.17

The Return-Loss is $< -20\text{dB}$, and within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the value result should support extended cabration.

ANNEX K: Sensor Triggering Data Summary

Per FCC KDB Publication 616217 D04, this device was tested by the manufacturer to determine the proximity sensor triggering distances for all applicable sides and edges of the device. The measured output power at distances within ± 5 mm of the triggering points (or until touching the phantom) is included for back side and each applicable edge per Step i) in Section 6.2 of the KDB. The technical descriptions in the filing contain the complete set of triggering data required by Section 6 of FCC KDB Publication 616217 D04.

To ensure all production units are compliant, it is necessary to test SAR at a distance 1 mm less than the smallest distance between the device and SAR phantom with the device at the maximum output power (without power reduction). These SAR tests are included in addition to the SAR tests for the device touching the SAR phantom (at the reduced output power level).

We tested the power and got the different proximity sensor triggering distances for front, rear and top side. The manufacturer has declared 12mm is the most conservative triggering distance for main antenna with front side, 18mm distance for rear side and 18mm distance for bottom side.

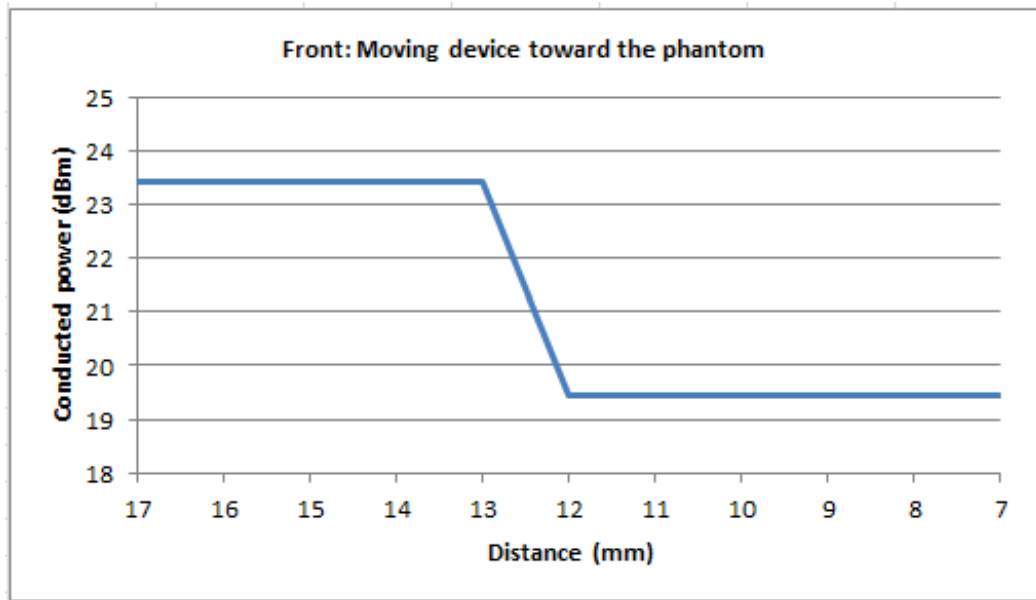
The operational description contains information explaining how this device remains compliant in the event of a sensor malfunction.

Main Antenna

Front Side

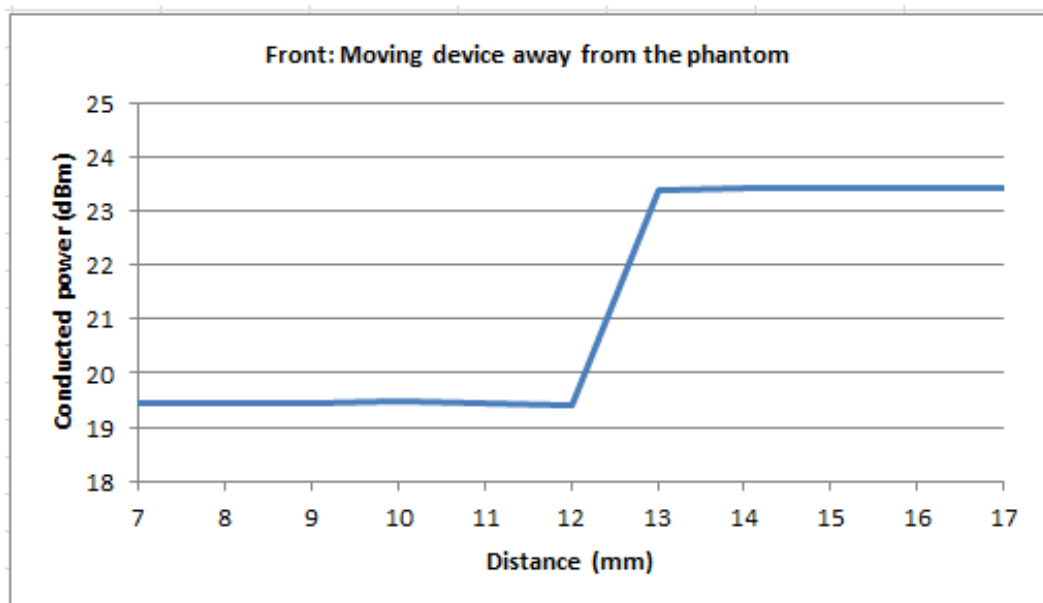
Moving device toward the phantom:

Distance(mm)	17	16	15	14	13	12	11	10	9	8	7
Main Antenna	23.41	23.40	23.42	23.41	23.40	19.44	19.45	19.43	19.46	19.43	19.45



Moving device away from the phantom:

Distance(mm)	7	8	9	10	11	12	13	14	15	16	17
Main Antenna	19.45	19.43	19.45	19.48	19.44	19.41	23.39	23.40	23.42	23.41	23.41

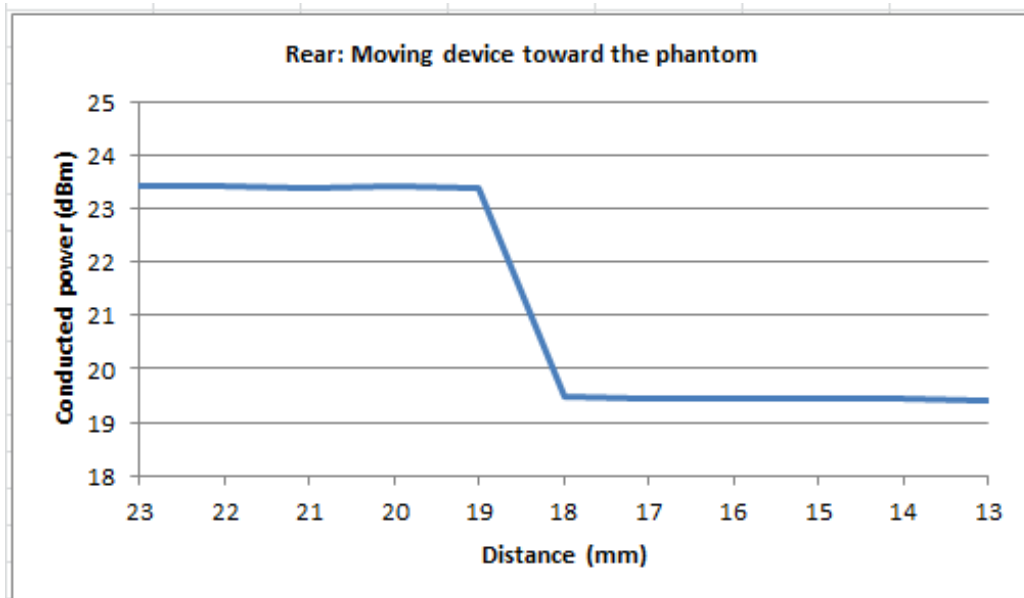


Based on the most conservative measured triggering distance of 12 mm, additional SAR measurements were required at 11 mm from the front side for the above modes.

Rear Side

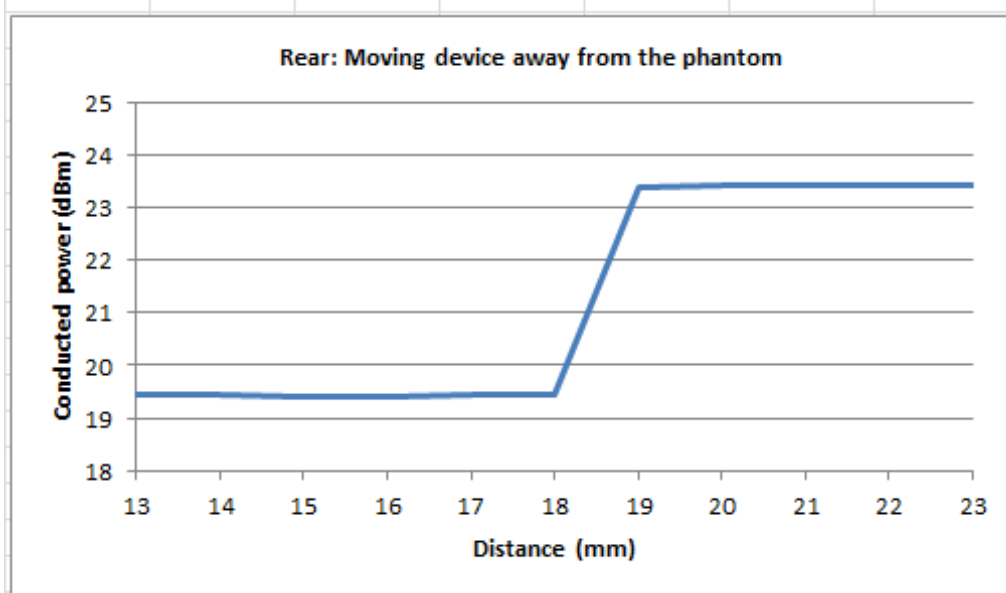
Moving device toward the phantom:

Distance(mm)	23	22	21	20	19	18	17	16	15	14	13
Main Antenna	23.40	23.42	23.38	23.41	23.39	19.47	19.46	19.45	19.46	19.44	19.42



Moving device away from the phantom:

Distance(mm)	13	14	15	16	17	18	19	20	21	22	23
Main Antenna	19.46	19.44	19.42	19.40	19.45	19.45	23.39	23.41	23.41	23.40	23.42

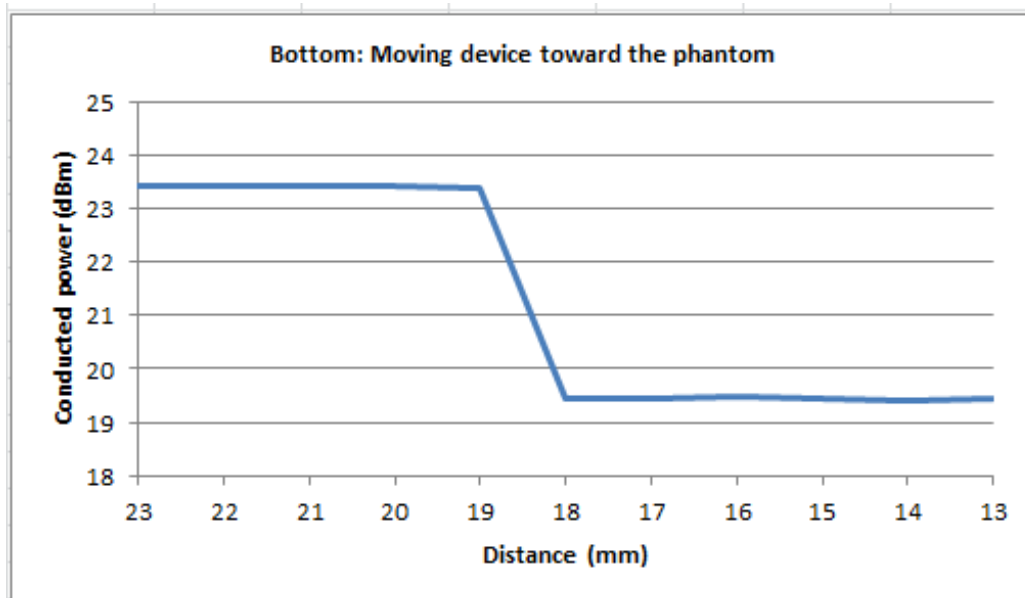


Based on the most conservative measured triggering distance of 18 mm, additional SAR measurements were required at 17 mm from the Rear side for the above modes.

Bottom Side

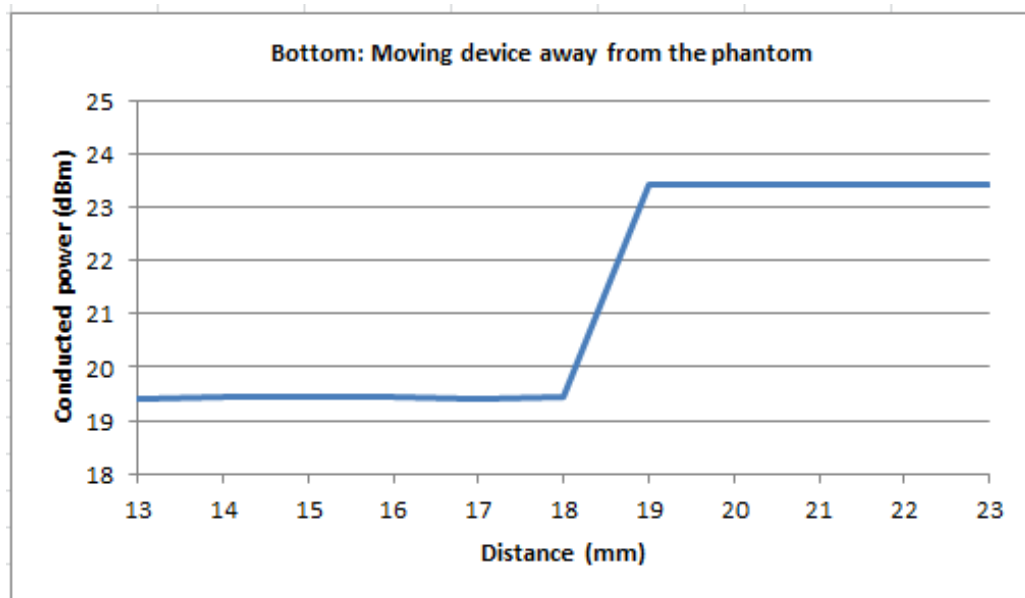
Moving device toward the phantom:

Distance(mm)	23	22	21	20	19	18	17	16	15	14	13
Main Antenna	23.40	23.41	23.40	23.42	23.38	19.45	19.46	19.47	19.44	19.42	19.43



Moving device away from the phantom:

Distance(mm)	13	14	15	16	17	18	19	20	21	22	23
Main Antenna	19.41	19.43	19.44	19.44	19.42	19.44	23.40	23.41	23.41	23.42	23.41



Based on the most conservative measured triggering distance of 18 mm, additional SAR measurements were required at 17 mm from the bottom side for the above modes.

END OF REPORT