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

Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	2.01 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**57.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.3 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.0 ± 6 %	2.20 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	14.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**55.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.6 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.0 Ω - 5.6 jΩ
Return Loss	- 23.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.6 Ω - 4.4 jΩ
Return Loss	- 22.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 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

DASY5 Validation Report for Head TSL

Date: 21.07.2020

Test Laboratory: SPEAG, Zurich, Switzerland

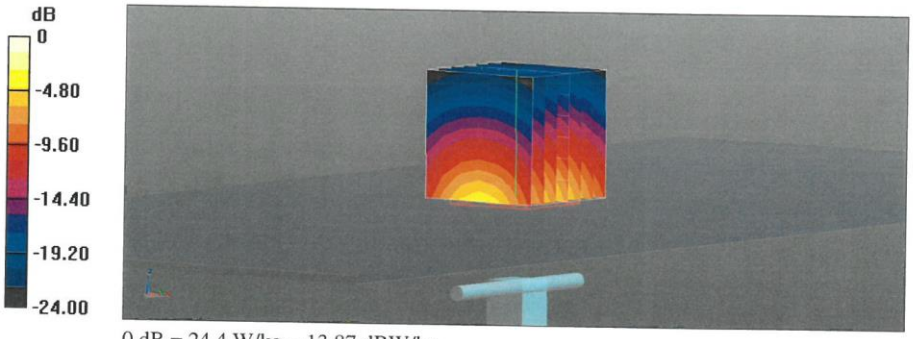
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1012

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.01 S/m; ε_r = 37.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

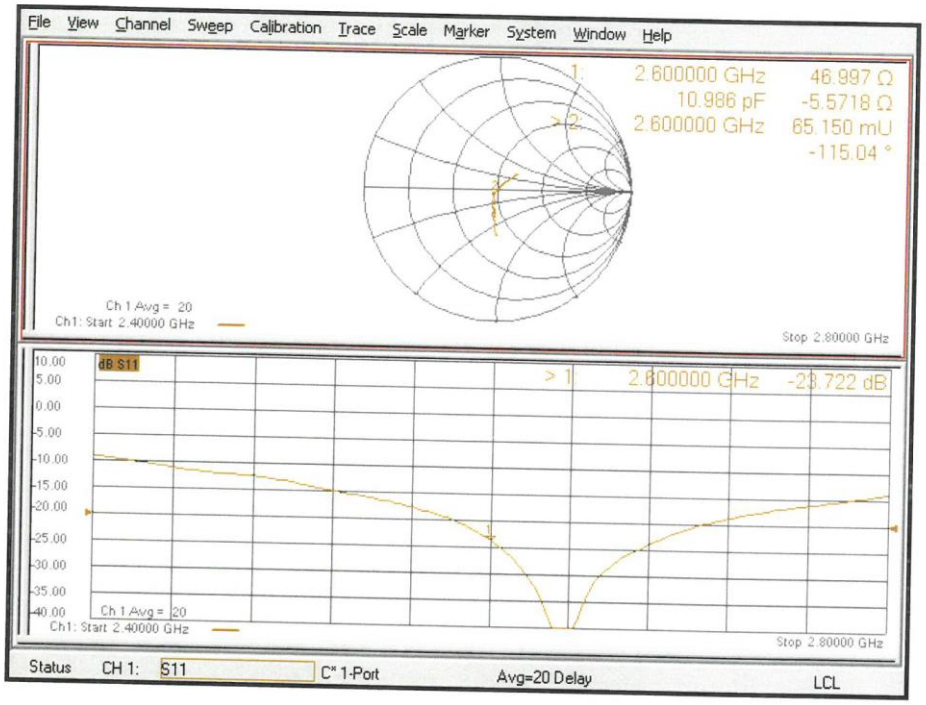
- Probe: EX3DV4 - SN7349; ConvF(7.54, 7.54, 7.54) @ 2600 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

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 = 121.2 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 29.3 W/kg
SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.40 W/kg
Smallest distance from peaks to all points 3 dB below = 8.9 mm
Ratio of SAR at M2 to SAR at M1 = 49.4%
Maximum value of SAR (measured) = 24.4 W/kg



0 dB = 24.4 W/kg = 13.87 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 21.07.2020

Test Laboratory: SPEAG, Zurich, Switzerland

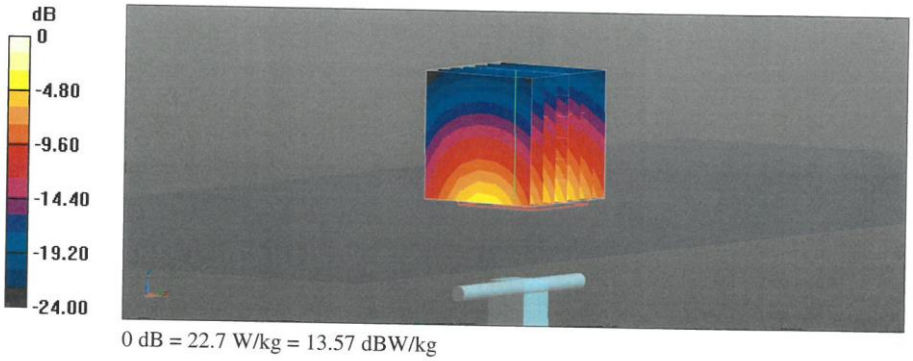
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1012

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.20 S/m; ε_r = 51.0; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

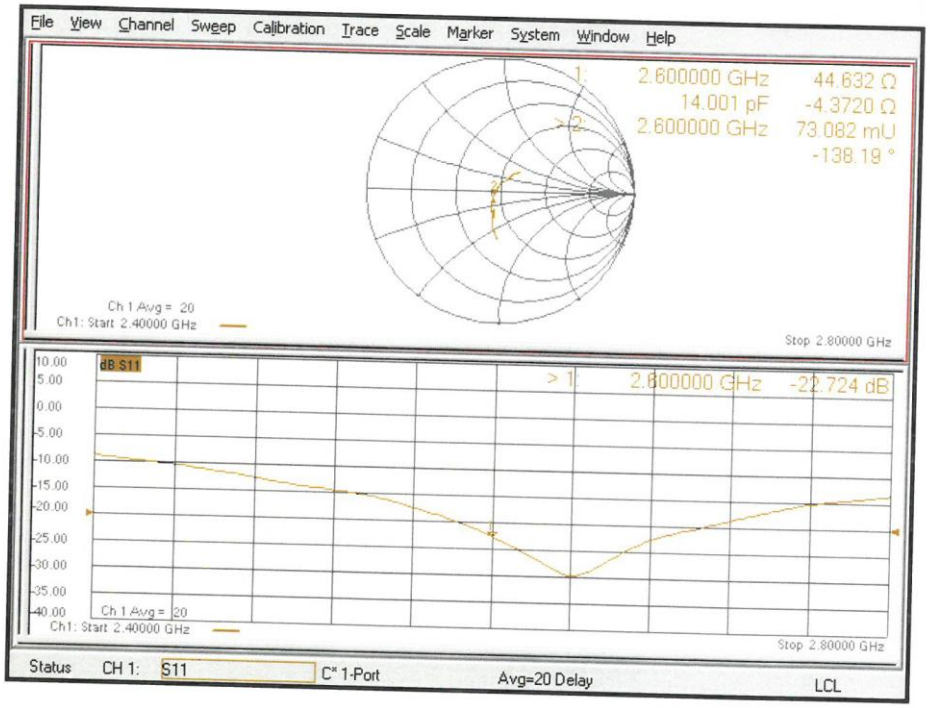
- Probe: EX3DV4 - SN7349; ConvF(7.68, 7.68, 7.68) @ 2600 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

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 = 110.5 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 28.0 W/kg
SAR(1 g) = 14.0 W/kg; SAR(10 g) = 6.20 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 50.8%
Maximum value of SAR (measured) = 22.7 W/kg



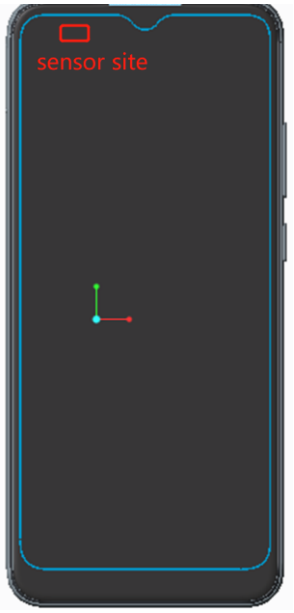
0 dB = 22.7 W/kg = 13.57 dBW/kg

Impedance Measurement Plot for Body TSL



ANNEX I Sensor Triggering Data Summary

SAR sensor trigger Diagram：



Antenna	Trigger position	Trigger Distance(mm)
Diversity ANT	Front	13
	Rear	18
	Left	10
	Top	19

Per FCC KDB Publication 616217 D04v01r02, this device was tested by the manufacturer to determine the proximity sensor triggering distances for the rear and bottom edge of the device. The measured output power within ±5mm of the triggering points (or until touching the phantom) is included for rear and each applicable edge.

To ensure all production units are compliant it is necessary to test SAR at a distance 1mm less than the smallest distance from the device and SAR phantom (determined from these triggering tests according to the KDB 616217 D04v01r02) with the device at maximum output power without power reduction. These SAR tests are included in addition to the SAR tests for the device touching the SAR phantom, with reduced power.

We tested the power and got the different proximity sensor triggering distances for front, rear, left and top edge for Diversity ANT. The manufacturer has declared 13mm is the most conservative triggering distance for Diversity ANT with front edge. The 18mm distance for rear edge. The 10mm distance for left edge. The 19mm distance for top edge. So base on the most conservative triggering distance of 13/18/10/19mm, additional SAR measurements were required at 10/17/10/18mm from the highest SAR position between front/rear/left/top edge of Diversity ANT.

SAR sensor triggering verify procedure:

Install ABOV apk

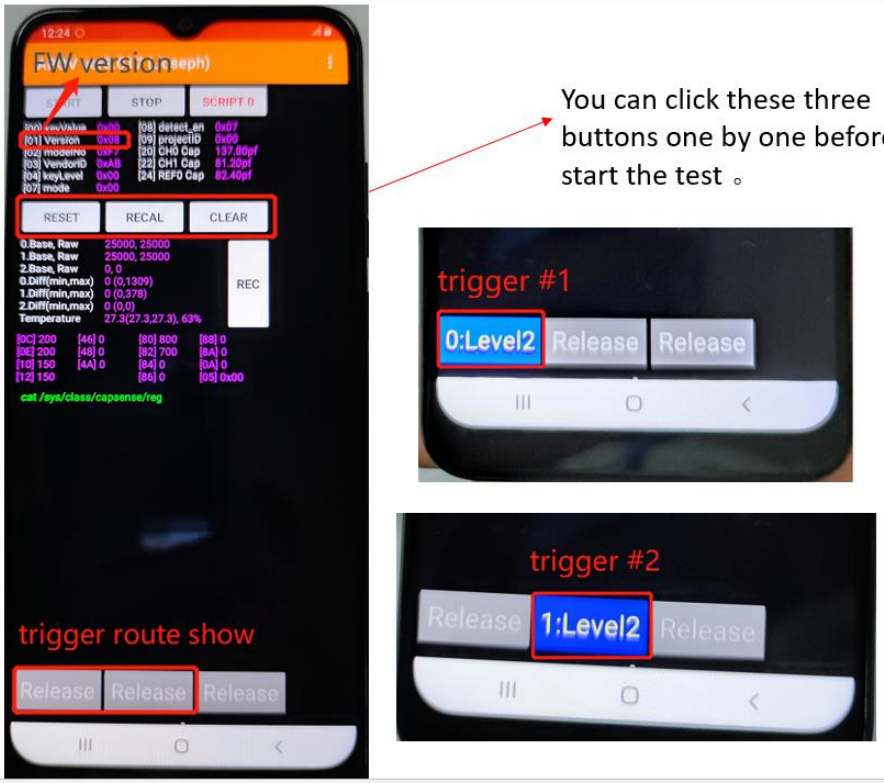
Connect the mobile phone to the computer and run the command window to execute the following commands：
adb root
adb remount
adb install “Drag in apk file”
enter

Sar apk.7z

Run APK to see if it is active

Click start to see if the capacitance value appears. If the capacitance value appears, APK is activated successfully

Verify trigger distance



Note: As described above, when the APK display is “Level”, it means that the sensor is triggered and the DUT is working under low power. Otherwise, the DUT will be working under normal power

Diversity ANT：

Front

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Diversity antenna	/	/	/	/	/	level	level	level	level	level	level

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Diversity antenna	level	level	level	level	level	level	/	/	/	/	/

Rear

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**
Diversity antenna	/	/	/	/	/	level	level	level	level	level	level

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Diversity antenna	level	level	level	level	level	level	/	/	/	/	/

Left Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**
Diversity antenna	/	/	/	/	/	level	level	level	level	level	level

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Diversity antenna	level	level	level	level	level	level	/	/	/	/	/

Top Edge

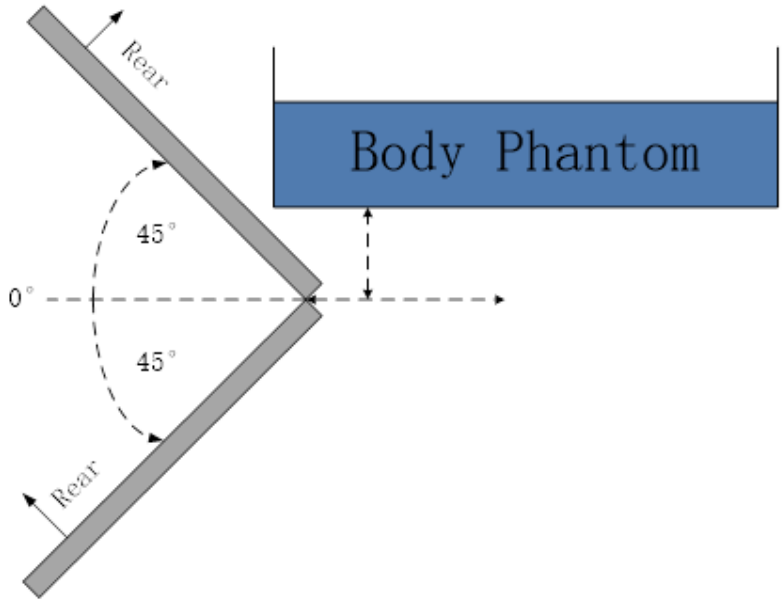
Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**
Diversity antenna	/	/	/	/	/	level	level	level	level	level	level

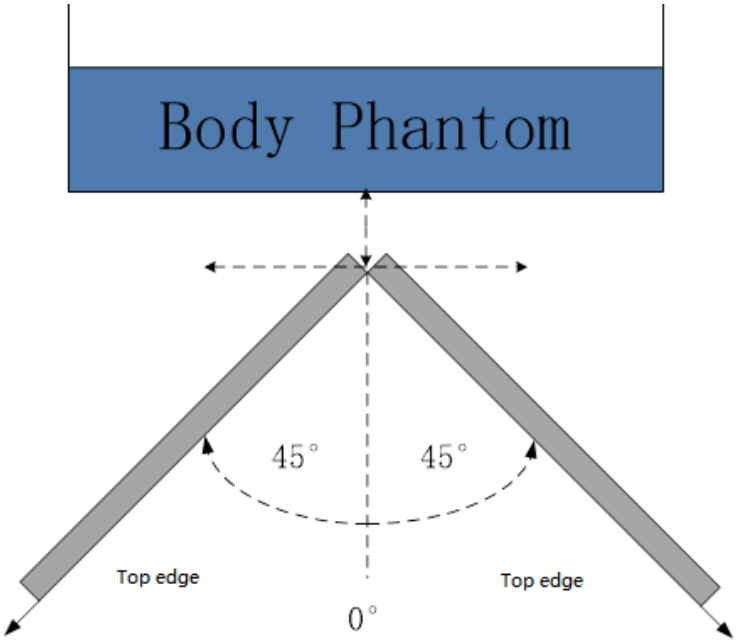
Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Diversity antenna	level	level	level	level	level	level	/	/	/	/	/

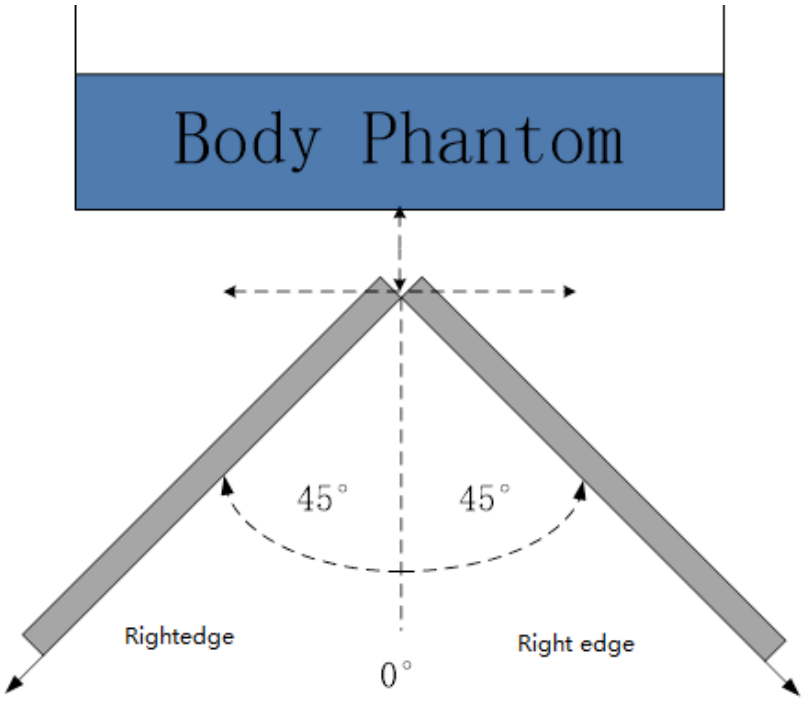
Per FCC KDB Publication 616217 D04v01r02, the influence of table tilt angles to proximity sensor triggering is determined by positioning each edge that contains a transmitting antenna, perpendicular to the flat phantom, at the smallest sensor triggering test distanceby rotating the device around the edge next to the phantom in ≤ 10° increments until the tablet is ±45° or more from the vertical position at 0°.



The front/rear evaluation



The bottom/top edge evaluation



The Left edge evaluation

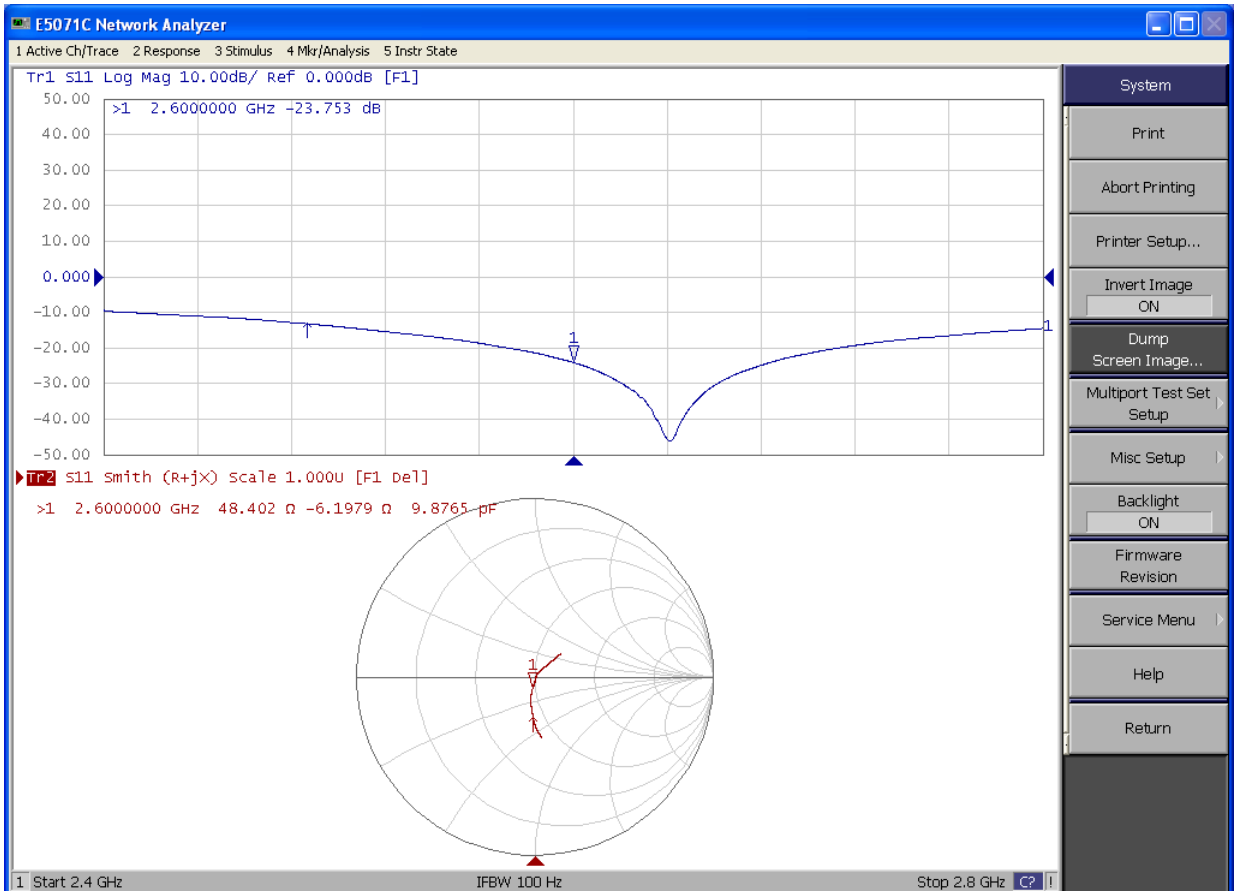
Based on the above evaluation, we come to the conclusion that the sensor triggering is not released and normal maximum output power is not restored within the ±45° range at the smallest sensor triggering test distance declared by manufacturer.

ANNEX J Extended Calibration SAR Dipole

Referring to KDB865664 D01, if dipoles are verified in return loss (<-20dBm, 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 D2600V2– serial no.1012

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2020-7-21	-23.72	\	47.0	\	-5.6	\
2021-7-15	-23.75	0.12	48.4	1.4	-6.2	-0.6



ANNEX K Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2020-09-29 through 2021-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program