

10G Dipole Calibration Certificate

**Calibration Laboratory of
Schmid & Partner
Engineering AG**
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
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S Servizio svizzero di taratura
S Swiss Calibration Service

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **CTTL (Auden)**

Certificate No: **5G-Veri10-1005_Jan22**

CALIBRATION CERTIFICATE

Object: **5G Verification Source 10 GHz - SN: 1005**

Calibration procedure(s): **QA CAL-45.v3
Calibration procedure for sources in air above 6 GHz**

Calibration date: **January 24, 2022**



This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Reference Probe EUmmWV3	SN: 9374	2021-12-21(No. EUmmWV3-9374_Dec21)	Dec-22
DAE4ip	SN: 1602	2021-06-25 (No. DAE4ip-1602_Jun21)	Jun-22

Secondary Standards	ID #	Check Date (in house)	Scheduled Check

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	

Issued: January 26, 2022

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Measurement Conditions

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

DASY Version	cDASY6 Module mmWave	V2.4
Phantom	5G Phantom	
Distance Horn Aperture - plane	10 mm	
XY Scan Resolution	dx, dy = 7.5 mm	
Number of measured planes	2 (10mm, 10mm + $\lambda/4$)	
Frequency	10 GHz \pm 10 MHz	

Calibration Parameters, 10 GHz

Circular Averaging

Distance Horn Aperture to Measured Plane	<i>Prad</i> ¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg Power Density Avg (psPDn+, psPDtot+, psPDmod+) (W/m ²)		Uncertainty (k = 2)
				1 cm ²	4 cm ²	
10 mm	86.1	147	1.27 dB	54.4	51.2	1.28 dB

Square Averaging

Distance Horn Aperture to Measured Plane	<i>Prad</i> ¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg Power Density Avg (psPDn+, psPDtot+, psPDmod+) (W/m ²)		Uncertainty (k = 2)
				1 cm ²	4 cm ²	
10 mm	86.1	147	1.27 dB	54.5	51.1	1.28 dB

¹ Assessed ohmic and mismatch loss plus numerical offset: 0.55 dB

DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1005	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

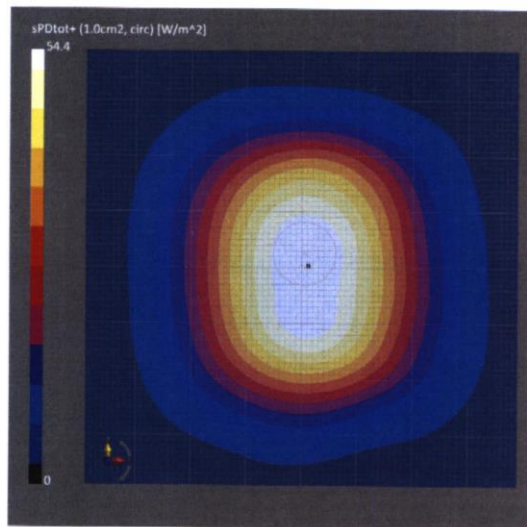
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2021-12-21	DAE4ip Sn1602, 2021-06-25

Scan Setup

	5G Scan
Grid Extents [mm]	120.0 x 120.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	10.0
MAIA	MAIA not used

Measurement Results

	5G Scan
Date	2022-01-24, 07:50
Avg. Area [cm ²]	1.00
psPDn+ [W/m ²]	54.2
psPDtot+ [W/m ²]	54.4
psPDmod+ [W/m ²]	54.6
E _{max} [V/m]	147
Power Drift [dB]	0.01



DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1005	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

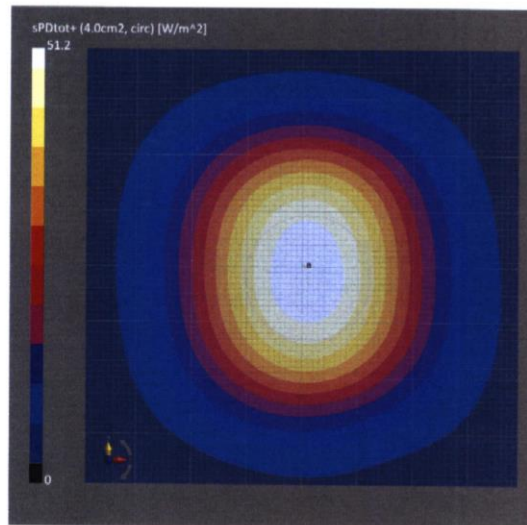
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2021-12-21	DAE4ip Sn1602, 2021-06-25

Scan Setup

	5G Scan
Grid Extents [mm]	120.0 x 120.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	10.0
MAIA	MAIA not used

Measurement Results

	5G Scan
Date	2022-01-24, 07:50
Avg. Area [cm ²]	4.00
psPDn+ [W/m ²]	51.0
psPDtot+ [W/m ²]	51.2
psPDmod+ [W/m ²]	51.4
E _{max} [V/m]	147
Power Drift [dB]	0.01



DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1005	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2021-12-21	DAE4ip Sn1602, 2021-06-25

Scan Setup

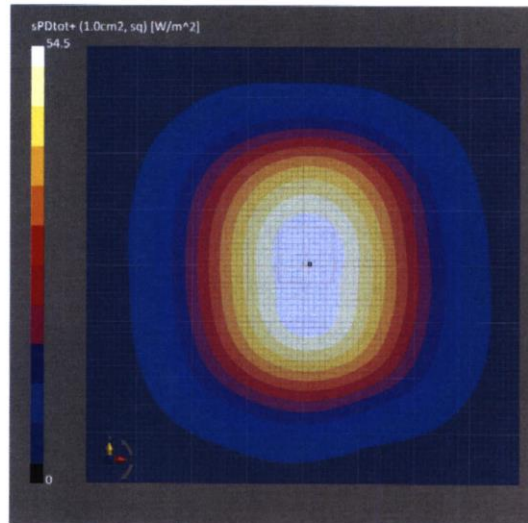
Grid Extents [mm]
Grid Steps [lambda]
Sensor Surface [mm]
MAIA

5G Scan
120.0 x 120.0
0.25 x 0.25
10.0
MAIA not used

Measurement Results

Date
Avg. Area [cm²]
psPDn+ [W/m²]
psPDtot+ [W/m²]
psPDmod+ [W/m²]
E_{max} [V/m]
Power Drift [dB]

5G Scan
2022-01-24, 07:50
1.00
54.3
54.5
54.6
147
0.01



DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1005	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

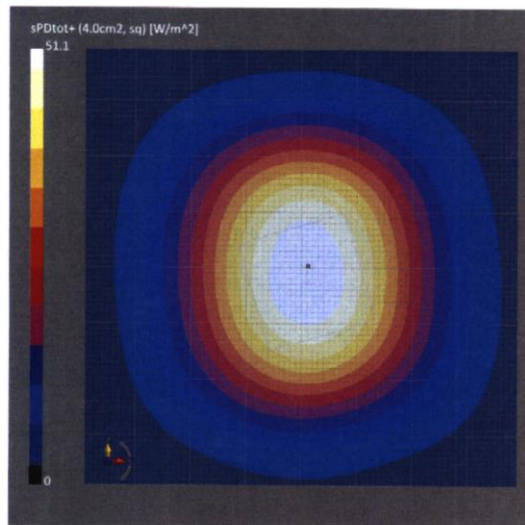
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2021-12-21	DAE4ip Sn1602, 2021-06-25

Scan Setup

	5G Scan
Grid Extents [mm]	120.0 x 120.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	10.0
MAIA	MAIA not used

Measurement Results

	5G Scan
Date	2022-01-24, 07:50
Avg. Area [cm ²]	4.00
psPDn+ [W/m ²]	50.9
psPDtot+ [W/m ²]	51.1
psPDmod+ [W/m ²]	51.2
E _{max} [V/m]	147
Power Drift [dB]	0.01



ANNEX I Sensor Triggering Data Summary

ANT0:

SAR Sensor	Front	18(mm)
	Rear	16(mm)
	Left	16(mm)
	Top	21(mm)

ANT1:

SAR Sensor	Front	20(mm)
	Rear	20(mm)
	Left	15(mm)
	Bottom	15(mm)

ANT2:

SAR Sensor	Front	26(mm)
	Rear	20(mm)
	Right	26(mm)
	Top	25(mm)

ANT4:

SAR Sensor	Rear	20(mm)
	Right	11(mm)

ANT9:

SAR Sensor	Front	18(mm)
	Rear	20(mm)
	Left	26(mm)

Front, Rear, Top, Bottom, Left and Right of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

ANT0
Front

Moving device toward the phantom:

The power state											
Distance [mm]	23	22	21	20	19	18	17	16	15	14	13
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

Moving device away from the phantom:

The power state											
Distance [mm]	13	14	15	16	17	18	19	20	21	22	23
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

Rear/Left

Moving device toward the phantom:

The power state											
Distance [mm]	21	20	19	18	17	16	15	14	13	12	11
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

Moving device away from the phantom:

The power state											
Distance [mm]	11	12	13	14	15	16	17	18	19	20	21
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

Top

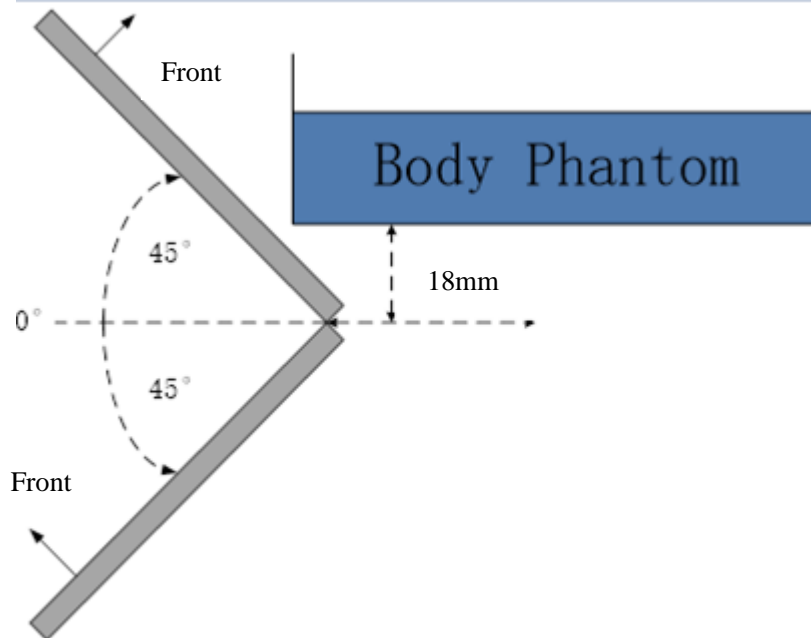
Moving device toward the phantom:

The power state											
Distance [mm]	26	25	24	23	22	21	20	19	18	17	16
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

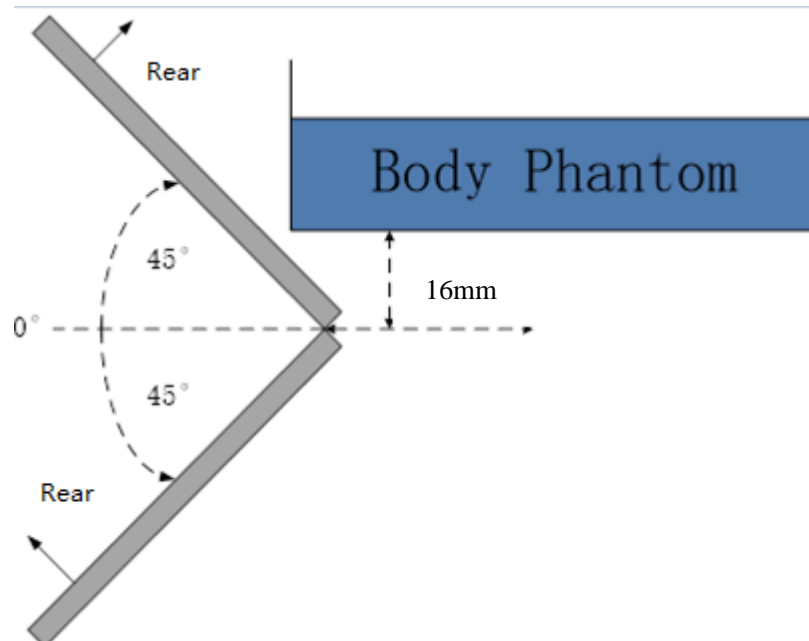
Moving device away from the phantom:

The power state											
Distance [mm]	16	17	18	19	20	21	22	23	24	25	26
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

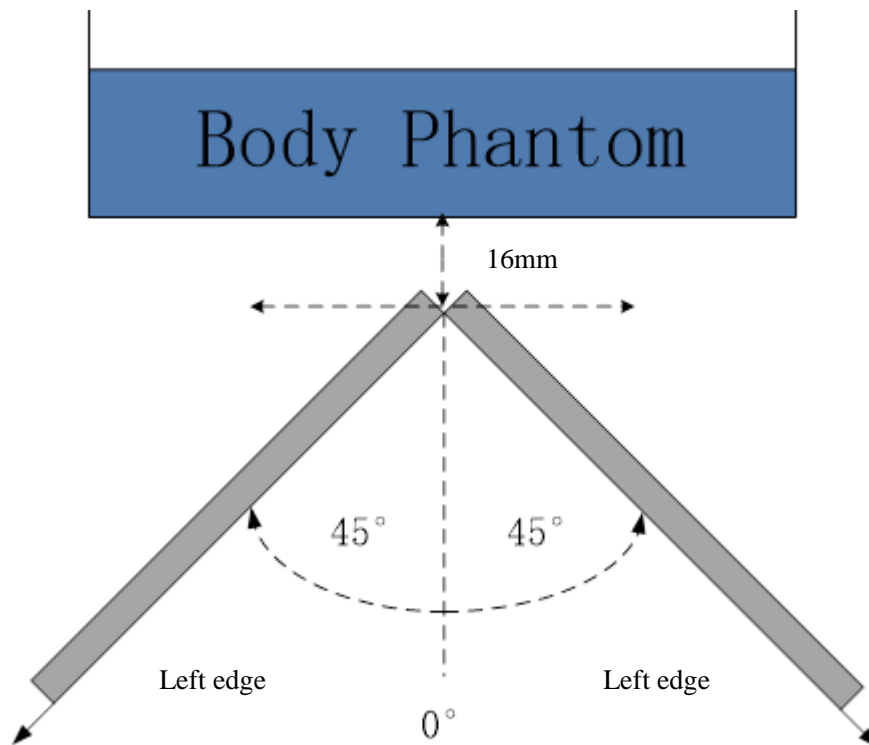
The influence of table tilt angles to proximity sensor triggering is determined by positioning each edge that contains a transmitting antenna, perpendicular to the flat phantom, at the smallest sensor triggering test distance by rotating the device around the edge next to the phantom in $\leq 10^\circ$ increments until the tablet is $\pm 45^\circ$ or more from the vertical position at 0° .



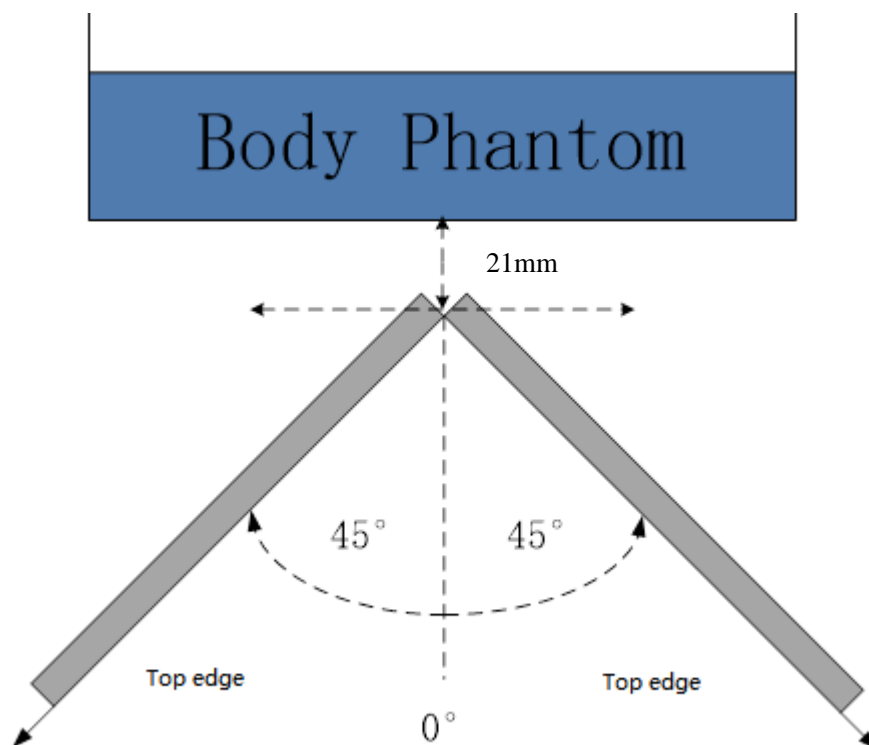
The Front evaluation for ANT0



The Rear evaluation for ANT0



The Left edge evaluation for ANT0



The Top edge evaluation for ANT0

ANT1
Front/Rear

Moving device toward the phantom:

The power state											
Distance [mm]	25	24	23	22	21	20	19	18	17	16	15
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

Moving device away from the phantom:

The power state											
Distance [mm]	15	16	17	18	19	20	21	22	23	24	25
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

Left/Bottom

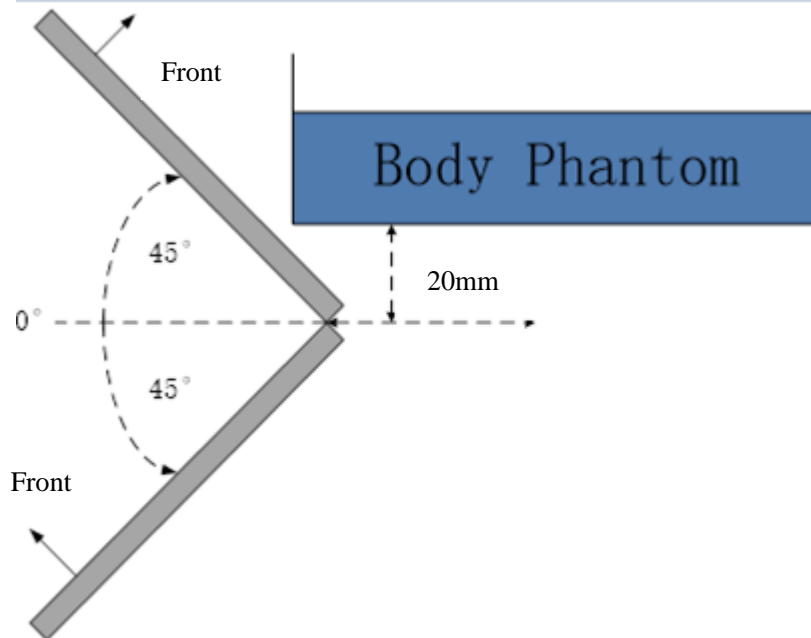
Moving device toward the phantom:

The power state											
Distance [mm]	20	19	18	17	16	15	14	13	12	11	10
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

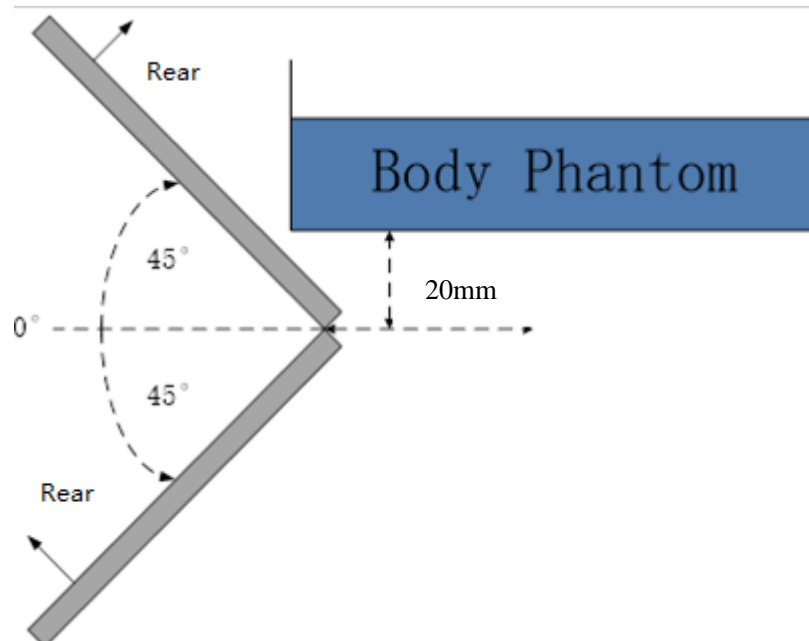
Moving device away from the phantom:

The power state											
Distance [mm]	10	11	12	13	14	15	16	17	18	19	20
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

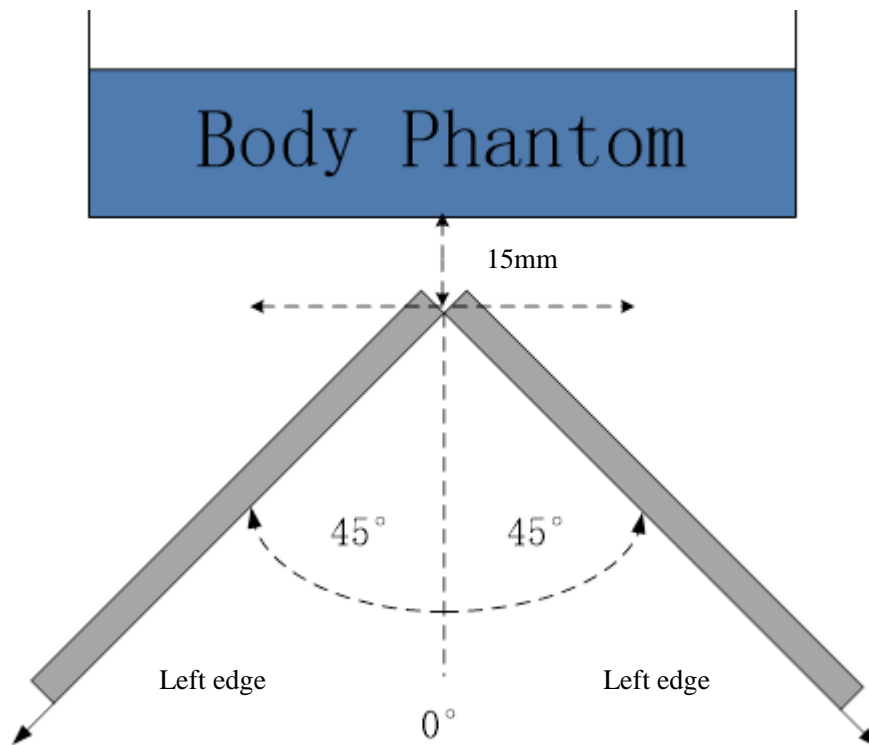
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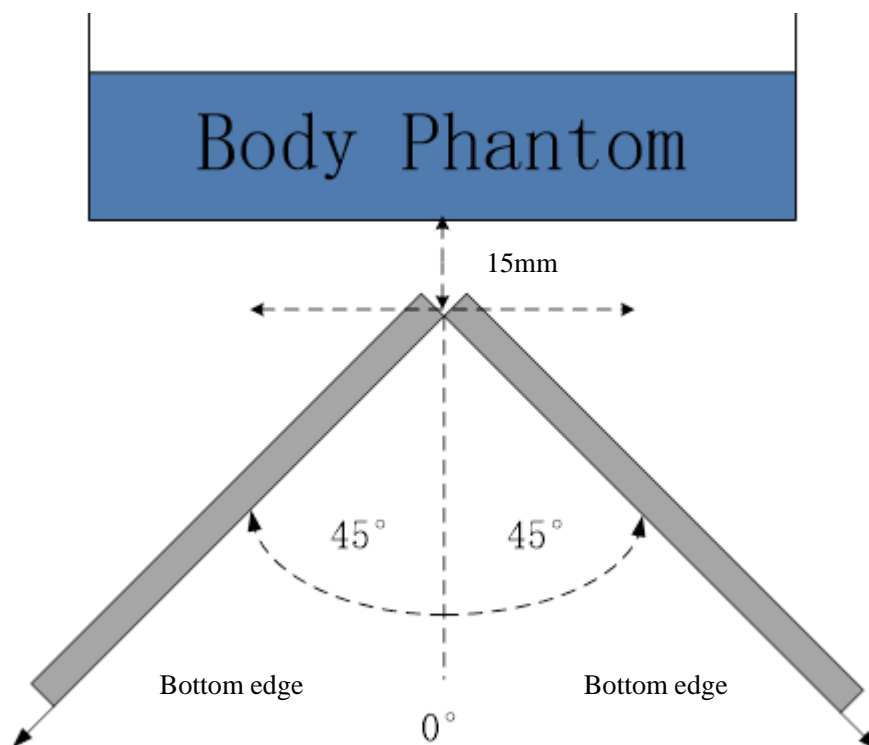
The Front evaluation for ANT1



The Rear evaluation for ANT1



The Left edge evaluation for ANT1



The Bottom edge evaluation for ANT1

ANT2
Front/Right

Moving device toward the phantom:

The power state											
Distance [mm]	31	30	29	28	27	26	25	24	23	22	21
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

Moving device away from the phantom:

The power state											
Distance [mm]	21	22	23	24	25	26	27	28	29	30	31
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

Rear

Moving device toward the phantom:

The power state											
Distance [mm]	25	24	23	22	21	20	19	18	17	16	15
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

Moving device away from the phantom:

The power state											
Distance [mm]	15	16	17	18	19	20	21	22	23	24	25
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

Top

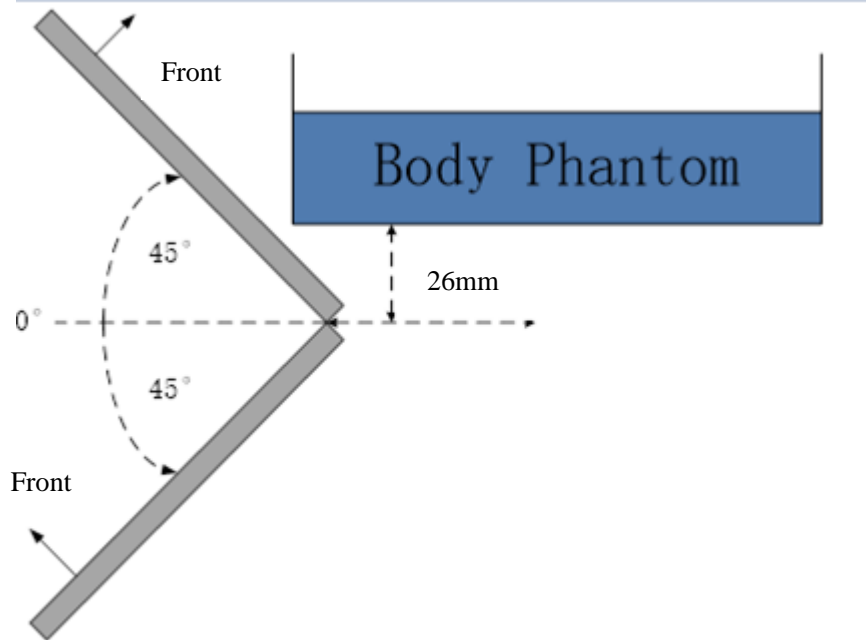
Moving device toward the phantom:

The power state											
Distance [mm]	30	29	28	27	26	25	24	23	22	21	20
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

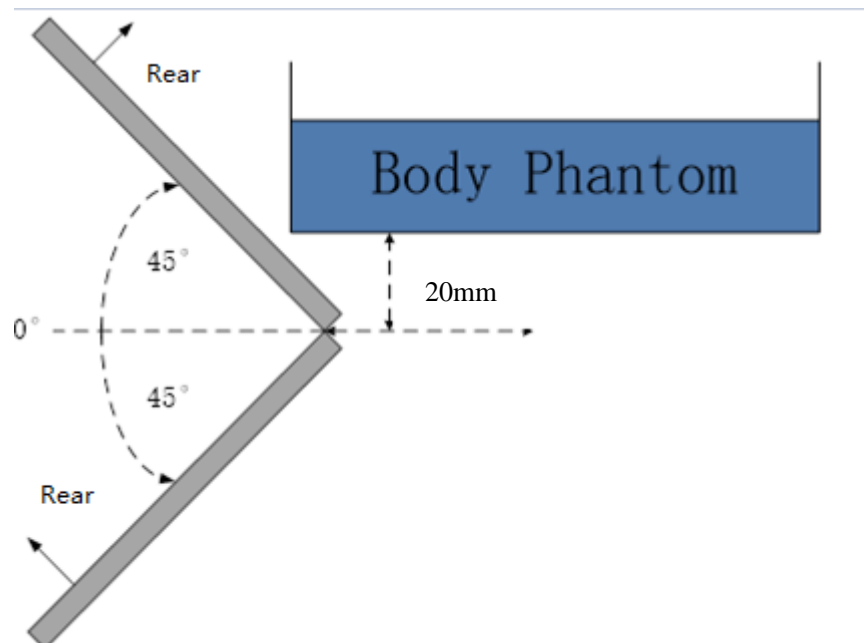
Moving device away from the phantom:

The power state											
Distance [mm]	20	21	22	23	24	25	26	27	28	29	30
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

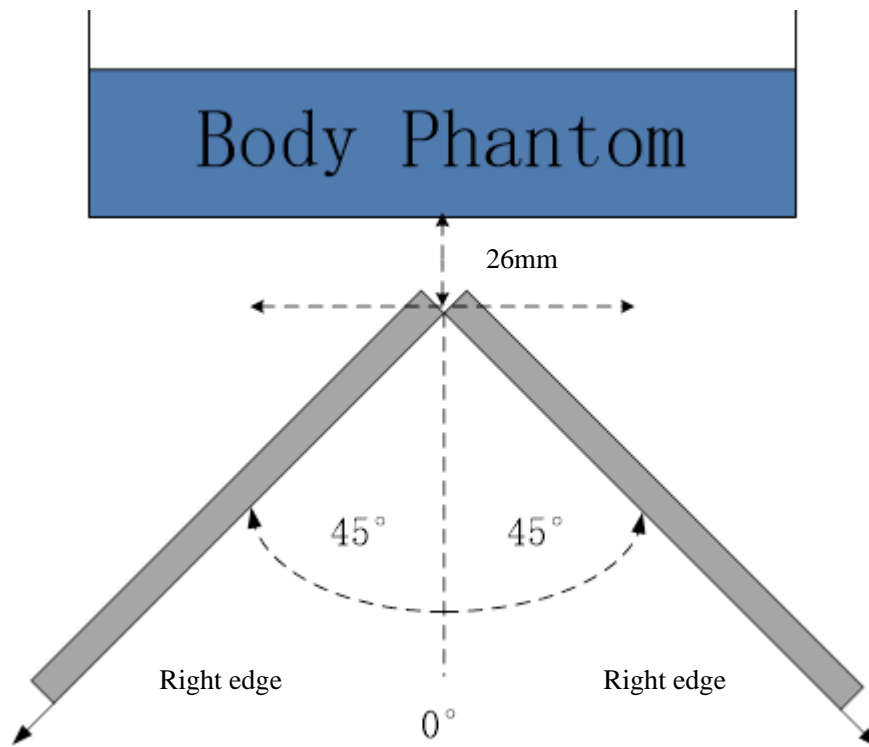
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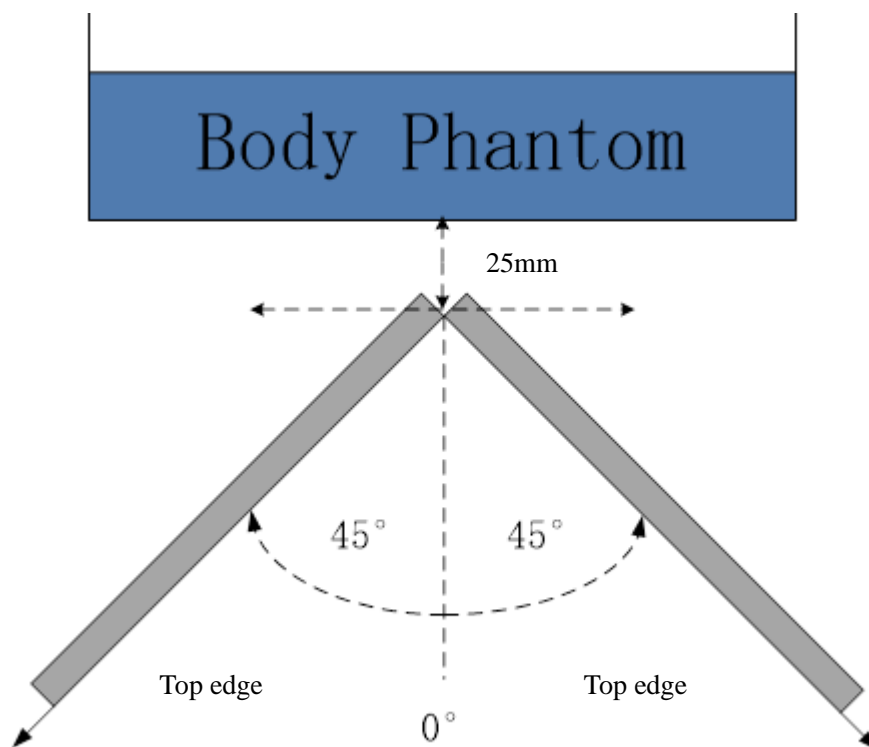
The Front evaluation for ANT2



The Rear evaluation for ANT2



The Right edge evaluation for ANT2



The Top edge evaluation for ANT2

ANT4
Rear

Moving device toward the phantom:

The power state											
Distance [mm]	25	24	23	22	21	20	19	18	17	16	15
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

Moving device away from the phantom:

The power state											
Distance [mm]	15	16	17	18	19	20	21	22	23	24	25
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

Right

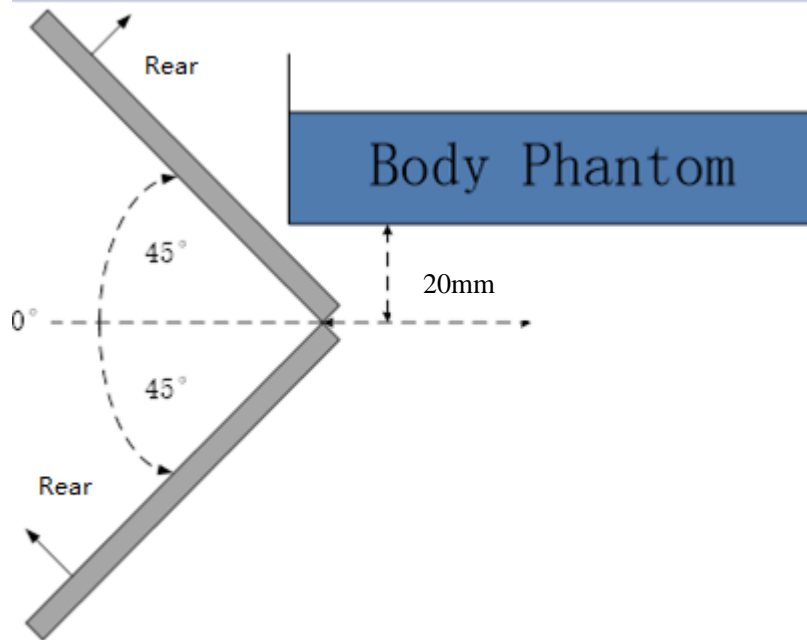
Moving device toward the phantom:

The power state											
Distance [mm]	16	15	14	13	12	11	10	9	8	7	6
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

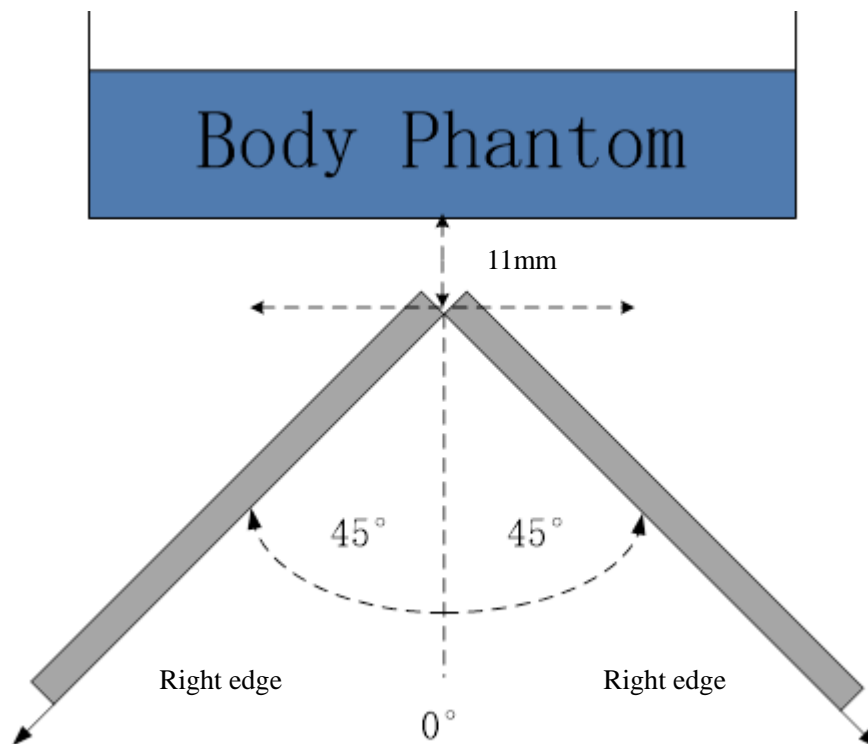
Moving device away from the phantom:

The power state											
Distance [mm]	6	7	8	9	10	11	12	13	14	15	16
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

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 distance by rotating the device around the edge next to the phantom in $\leq 10^\circ$ increments until the tablet is $\pm 45^\circ$ or more from the vertical position at 0° .



The Rear evaluation for ANT4



The Right edge evaluation for ANT4

ANT5

Front

Moving device toward the phantom:

The power state											
Distance [mm]	23	22	21	20	19	18	17	16	15	14	13
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

Moving device away from the phantom:

The power state											
Distance [mm]	13	14	15	16	17	18	19	20	21	22	23
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

Rear

Moving device toward the phantom:

The power state											
Distance [mm]	25	24	23	22	21	20	19	18	17	16	15
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

Moving device away from the phantom:

The power state											
Distance [mm]	15	16	17	18	19	20	21	22	23	24	25
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

Left

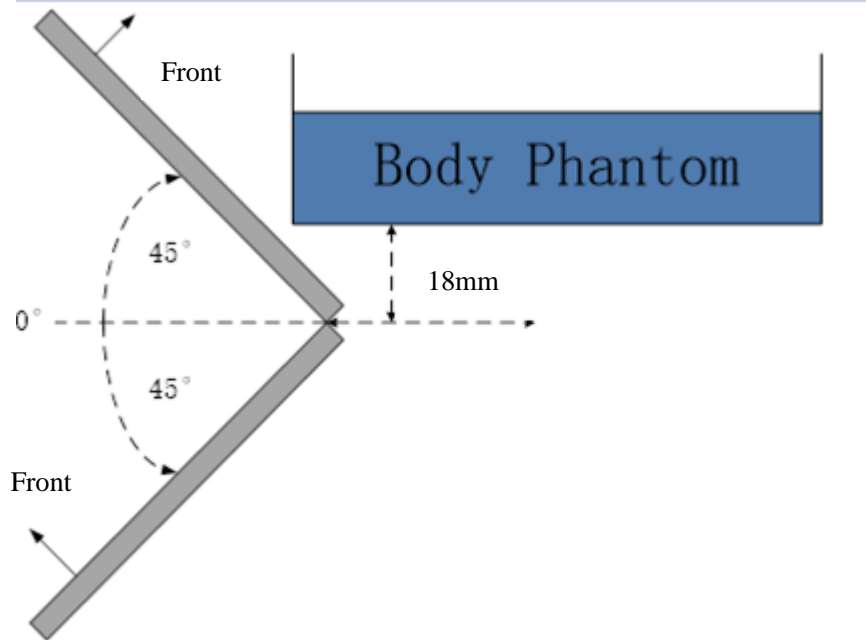
Moving device toward the phantom:

The power state											
Distance [mm]	31	30	29	28	27	26	25	24	23	22	21
Main antenna	Normal	Normal	Normal	Normal	Normal	Low	Low	Low	Low	Low	Low

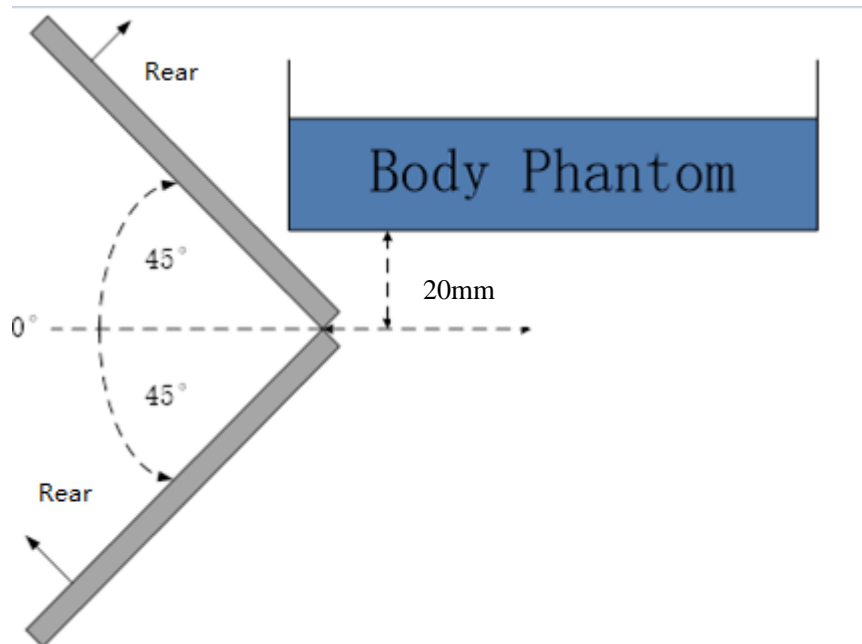
Moving device away from the phantom:

The power state											
Distance [mm]	21	22	23	24	25	26	27	28	29	30	31
Main antenna	Low	Low	Low	Low	Low	Low	Normal	Normal	Normal	Normal	Normal

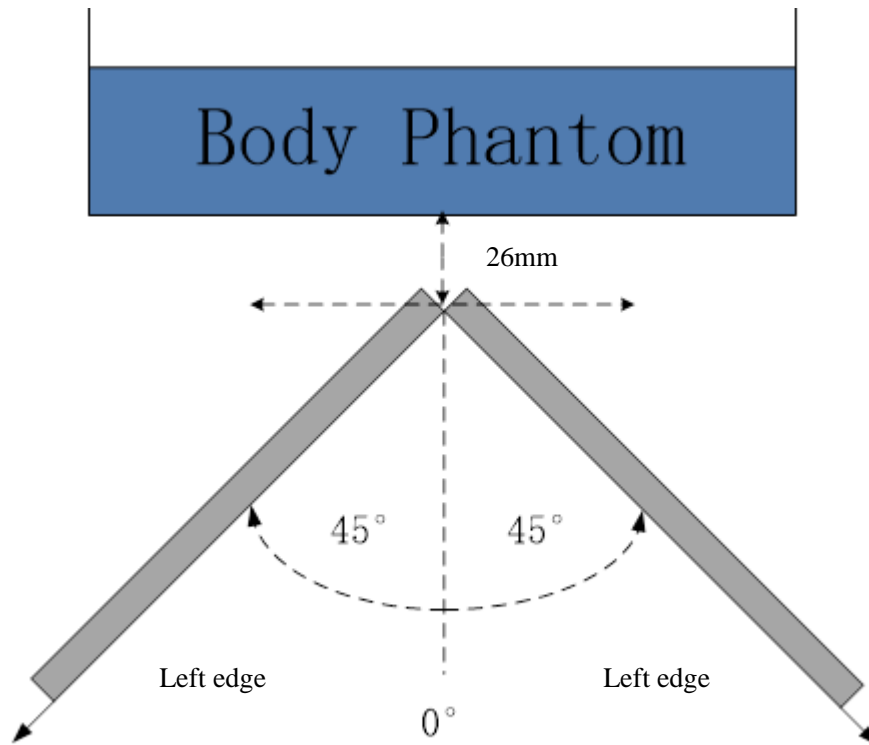
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The Front evaluation for ANT5



The Rear evaluation for ANT5



The Left edge evaluation for ANT5

ANNEX J Accreditation Certificate

<p>United States Department of Commerce National Institute of Standards and Technology</p>  	
<hr/> Certificate of Accreditation to ISO/IEC 17025:2017 <hr/>	
NVLAP LAB CODE: 600118-0	
Telecommunication Technology Labs, CAICT Beijing China	
<i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:</i>	
Electromagnetic Compatibility & Telecommunications	
<i>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 Communiqué dated January 2009).</i>	
<hr/> 2021-09-29 through 2022-09-30 <i>Effective Dates</i>	  <i>For the National Voluntary Laboratory Accreditation Program</i>