TEST REPORT FOR PD TESTING

Report No.: SRTC2024-9004(F)-24080501(U)

Product Name: Smart Phone

Applicant: Bluebird Inc.

FCC ID: SS4S50F1

Reference Specification
KDB 987594
Part 2.1093
IEC/IEEE 63170
IEC/IEEE 63195-1
IEC 62479
DASY6-mmWave SYSTEM HANDBOOK
DASY6 Application Note_ Interim Procedures for SAR & PD at 6 – 10 GHz

The State Radio_monitoring_center Testing Center (SRTC)

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1 GENERAL INFORMATION

1.1 Notes of the test report

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1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Designation number:	CN1267
Registration number:	239125
CAB identifier	CN0049
Test lab Number	7308A
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1.3 Applicant’s details

Company:	Bluebird Inc.
Address:	3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea

1.4 Manufacturer’s details

Company:	Bluebird Inc.
Address:	3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea

2 DESCRIPTION OF THE EQUIPMENT UNDER TEST

2.1 DUT information

Network	Band Information
Unlicensed	WLAN6GHz UNII-5
Unlicensed	WLAN6GHz UNII-6
Unlicensed	WLAN6GHz UNII-7
Unlicensed	WLAN6GHz UNII-8

Mode supported	Note
802.11a(6GHz)	NA
802.11ax HE20(6GHz)	NA
802.11ax HE40(6GHz)	NA
802.11ax HE80(6GHz)	NA
802.11ax HE160(6GHz)	NA

2.2 Exposure Conditions

General information

Free space: PD testing is over the air. Peak Spatially Averaged Power Density was evaluated over a area of 4cm2, the limit is 10W/m^2 (1mW/cm^2).

DUT Exposure Condition	Distance(mm)
Free space	2mm(λ/5 just for verification below 10GHz)

2.3 Other information

Testing Start Date:	2024/08/05
Testing End Date:	2024/08/08
DUT IMEI:	CJWQ-W7L-P23090011/CJWQ-W7L-P24040002
DUT H/W Version:	REV0.1
DUT S/W Version:	20230911_R1.17
Ambient Temperature:	25℃
Humidity:	40%
Note	NA

NOTE：In this project, there is a variant 70S, for which only the worst-case scenario is evaluated.

Declaration of Differences

We, Bluebird Inc. declare that only the external rubber shell is different between model S50 and model S70 as below:

The S70 is available in rubber rugged and plastic rugged types.

declare that there are two things.

3 SPECIFICATION

Name	Version	Title
KDB 987594	2022	UN6GHz pre-approval guidance checklist
Part 2.1093	Latest	Radio frequency radiation exposure evaluation: portable devices.
IEC/IEEE 63170	2018	Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz
IEC/IEEE 63195-1	2022	Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (frequency range of 6 GHz to 300 GHz) – Part 1: Measurement procedure
IEC 62479	2010	Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)
DASY6-mmWave SYSTEM HANDBOOK	February 24, 2022	DASY6 MODULE mmWave SYSTEM HANDBOOK incl. SW Module mmWave 3.0(Schmid & Partner Engineering AG)
DASY6 Application Note_ Interim Procedures for SAR & PD at 6 – 10 GHz	2020.10	Compliance Testing of Devices Operating between 6 – 10 GHz: Interim Procedures(Schmid & Partner Engineering AG)

4 TEST CONDITIONS

4.1 Test signal, frequencies and output power

The device was put into operation by using a call tester. Communication between the device and the call tester was established by air link. Non-signaling mode also applied.The device output power was set to maximum power level for all tests; a fully charged battery was used for every test sequence. For each wireless technology and frequency band used by the DUT, tests should be performed at the channel closest to the centre of each transmit frequency band. If the width of the transmit frequency band (Δf = f high – f low) exceeds 1 % of its centre frequency fc, then the channels at the lowest and highest frequencies of the transmit band are also tested. Furthermore, if the width of the transmit band exceeds 10 % of its centre frequency, the following formula is used to determine the number of channels, Nc, to be tested (**WIIF6E PD test frequency is only for the worst case from SAR report, if WIFI6E support full band across 5925-7125MHz, at least 5 channels shall be evaluated.**)

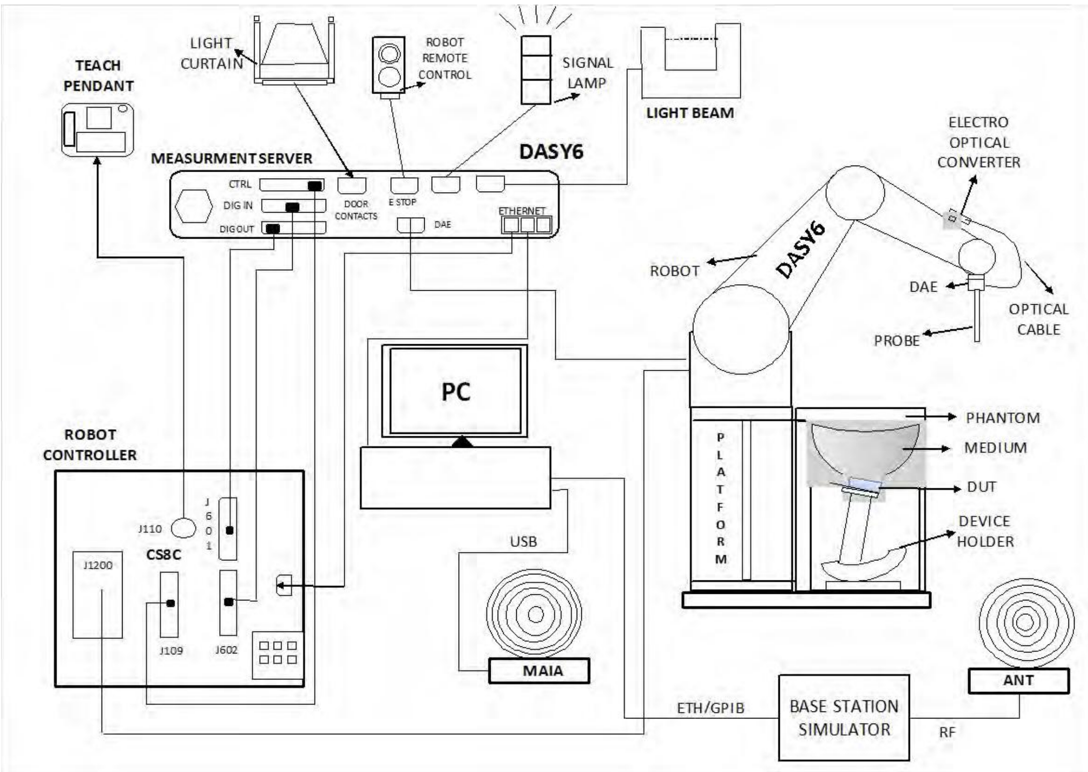
$$N_c = \min(2 \times \text{roundup}\,[10 \times (f_{high} - f_{low})/f_c] + 1, N)$$

where

f_c	is the centre frequency channel of the transmission band in Hz;
f_{high}	is the highest frequency channel of the transmission band in Hz;
f_{low}	is the lowest frequency channel of the transmission band in Hz;
N_c	is the number of channels to be tested;
N	is the total number of channels.

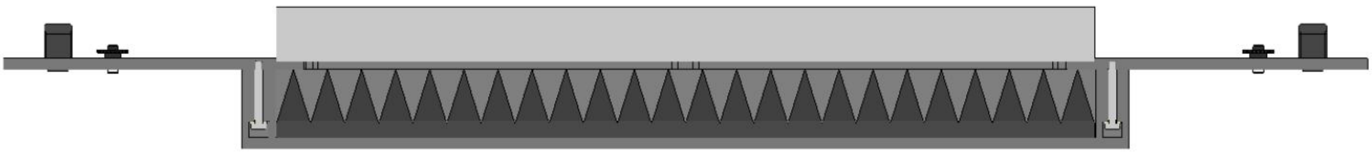
4.2 Measurement set-up

The system is based on a high precision robot (working range greater than 0.9m), which positions the probes with a positional repeatability of better than ± 0.02mm. probe sensors are directlyto the data acquisition unit. A cell controller system contains the power supply, robot controller, teaches pendant (Joystick), and remote control, is used to drive the robot motors. The PC consists of the Micron Pentium IV computer with Windows system and Measurement Software DASY, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The DAE consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical Downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection .The robot uses its own controller with a built in VME-bus computer.



4.3 Phantoms

The mmWave Phantom approximates free-space conditions, It consists of a 40mm thick Rohacell plate used as a test bed, which has a loss tangent (tanδ)≤0.05 and a relative permittivity (ϵr)≤1.2. High-performance RF absorbers are placed below the foam.



4.4 Device holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the Dasy system.

4.5 Parameter

The measurement procedure consists of measuring the PDinc at two different distances: d=2mm (compliance distance) and d=λ/5. The grid extents should be large enough to fully capture the transmitted energy. The grid step should be fine enough to demonstrate that the integrated Power Density iPDn varies by less than 1 dB between the d=2mm and d=λ/5
measurements.

Radio= iPDn(2mm)/iPDn(λ/5)
|10*log(Radio) |<1db

$$\ell_{\text{grid}} = \begin{cases} 1.25d & \text{for } d < \lambda/10 \\ \lambda/8 & \text{for } d \geq \lambda/10 \end{cases}.$$

$$\nu_{\text{grid}} \geq 2\lambda$$

Refer to manufacture analysis, system check use 10GHz source with 0.25λ gird step at 10mm distance is enough.

		$\mathrm{iPD}_n/\mathrm{iPD}_{n,\lambda}$ (dB) at evaluation distance z					
DUT	ℓ_{grid}	1 mm	2 mm	5 mm	10 mm	20 mm	$\lambda/2$
SH-10G	$\lambda/4$	1.78	0.88	0.55	0.23	0.0	0.17
	$\lambda/8$	0.51	0.31	0.42	0.26	0.13	0.16
	$\lambda/16$	0.05	0.4	0.42	0.26	0.04	0.16

In order to improve the accuracy of result in Reactive Near-Field for frequency band around 6.5GHz (WIFI 6E), SRTC use the most conservative grid step **λ/16=0.0625λ at 2mm** distance, grid step **λ/8=0.125λ at λ/5mm** distance.

For mmWave with higher frequency, **0.25λ** grid step applied.

Frequency [GHz]	Grid step	Grid extent X/Y [mm]	Measurement points
30	$0.25\left(\frac{\lambda}{4}\right)$	60/60	26×26
45	$0.25\left(\frac{\lambda}{4}\right)$	42/42	28×28
60	$0.25\left(\frac{\lambda}{4}\right)$	32.5/32.5	28×28
90	$0.25\left(\frac{\lambda}{4}\right)$	30/30	38×38

5 RESULT SUMMARY

PD Summary				
Exposure Position	Frequency Band	PD Result(W/m2)	Limit(W/m2)	Verdict
2mm	UNII-5(6185)	2.19	10	Pass
2mm	UNII-5(6345)	1.91	10	Pass
2mm	UNII-6	3.24	10	Pass
2mm	UNII-7	2.44	10	Pass
2mm	UNII-8	3.40	10	Pass
2mm	UNII-6(6505) Modified prototype	2.03	10	Pass

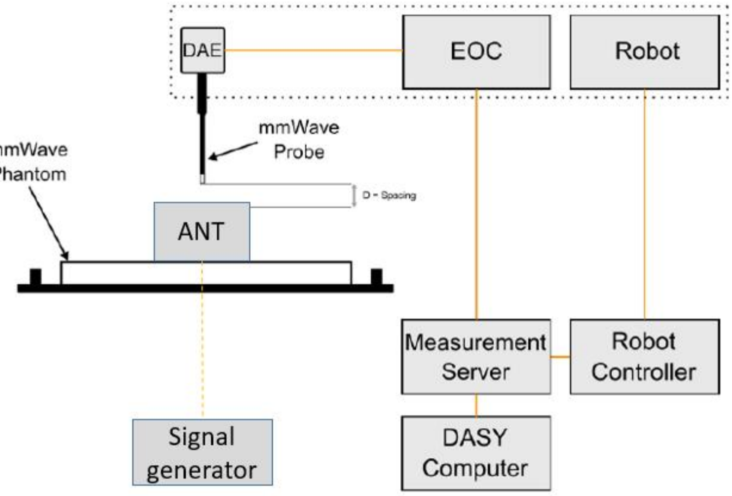
This Test Report Is Approved by: Mr. Peng Zhen 彭振	Review by: Mr. Li Bin 李彬
Tested and issued by: Mr. Hui Wen 惠文	Approved date: 20240808

6 PD RESULTS

6.1 System check

1)As system check requires an accurate and stable power to the source, it is recommended to power on and let the source warm up for approximately 30 min.

2)DUT Teaching: move the probe to a corner of the housing as close as possible to the surface. Record the z-coordinates in the “Teach DUT” pop-up window. Move the probe to the center of the source in the XY plane. Then slowly move the probe down to the previously recorded z-coordinate and click on “Confirm” to validate the position.



Note: Measurement accuracy can be reduced if connected to a ground pin at the backside of the robot arm, Create a measurement file with a test distance of 10mm for 10 GHz and 5.55mm (Horn build inside and 4.45mm to the outer surface) for 30 GHz and above. The sources at 30 GHz and above comprise horn antennas and very stable signal generators. The 10 GHz horn antenna has a SMA connector and can be connected to any signal generator.

Limit: The measured $psPD_{tot+}$ values is compared to the calibrated value and expected to be below 0.66 dB is 16.4%.(psPDn+ is AvgPowerDensityIncident, psPDmod+ is AvgPowerDensityMod)

Freq.(MHz)	Date	Measured PD (w/cm2)		Target (w/cm2)	Delta(%)	Tolerance(%)	Verdict
10000	2024/08/08	Circular 4cm2	148	151	-1.98%	±16.4	Pass

Test data

The measurement procedure is summarized below:

Fast Area Scan: A measurement scan where sensor voltages are sampled continuously while the robot is moving is used to determine the radiation pattern and the E-field maximum location.

5G Scan : a fine resolution scan performed on two different planes is used to reconstruct the E and H-fields as well as the PD on the measurement plane; the average PD is derived from this measurement.

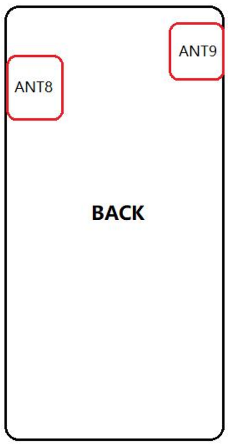
Note: The incident power density for WIFI6E must be measured for the test configuration producing the highest SAR value, and there is no need to evaluate other configuration.

Test and antenna position describe as follow:

Note: SRTC defined these positions (Back, Front, left, right, Top, Bottom) when facing the DUT screen.

The measured and reported PD values are tabulated below:

There is no additional correction factor apply to the measured value because of advanced method and uncertainty budget meet the requirement, more details please refer to uncertainty part in another file.



Unlicensed	Position	Distances to edge (mm)	Test or not	Note
Ant8	Back	0.0	YES	WIFI6GHz
	Front	8.0	YES	
	Top	11.0	YES	
	Bottom	144.0	NO	
	Left	2.0	YES	
	Right	61.0	NO	
Ant9	Back	0.0	YES	
	Front	8.0	YES	
	Top	4.0	YES	
	Bottom	146.0	NO	
	Left	45.0	NO	
	Right	2.0	YES	

The measured and reported PD values are tabulated below:

There is no additional correction factor apply to the measured value because of advanced method and uncertainty budget meet the requirement, more details please refer to uncertainty part in another file.

6.1.1 Unlicensed MIMO

2mm Separation Distance				Meas power(dBm)	Tune-up (dBm)	Scaling factor	Duty cycle	Duty factor	Meas. PD(w/m²)		Report PD(w/m²)	
WLAN6GHz UNII-5	Exposure condition	Position	Frequency (MHz)						First	Second	First	Second
802.11ax	2mm	Left	6185	14.18	14.50	1.08	100%	1.00	2.03	---	2.19	---
802.11ax	λ/5	Left	6185	14.18	14.50	1.08	100%	1.00	1.87	---	2.02	---

2mm Separation Distance				Meas power(dBm)	Tune-up (dBm)	Scaling factor	Duty cycle	Duty factor	Meas. PD(w/m²)		Report PD(w/m²)	
WLAN6GHz UNII-5	Exposure condition	Position	Frequency (MHz)						First	Second	First	Second
802.11ax	2mm	Right	6345	14.18	14.50	1.08	100%	1.00	1.77	---	1.91	---
802.11ax	λ/5	Right	6345	14.18	14.50	1.08	100%	1.00	1.63	---	1.76	---

2mm Separation Distance				Meas power(dBm)	Tune-up (dBm)	Scaling factor	Duty cycle	Duty factor	Meas. PD(w/m2)		Report PD(w/m2)	
WLAN6GHz UNII-6	Exposure condition	Position	Frequency (MHz)						First	Second	First	Second
802.11ax	2mm	Right	6505	13.68	14.00	1.08	100%	1.00	3.00	---	3.24	---
802.11ax	λ/5	Right	6505	13.68	14.00	1.08	100%	1.00	2.76	---	2.98	---

2mm Separation Distance				Meas power(dBm)	Tune-up (dBm)	Scaling factor	Duty cycle	Duty factor	Meas. PD(w/m2)		Report PD(w/m2)	
WLAN6GHz UNII-7	Exposure condition	Position	Frequency (MHz)						First	Second	First	Second
802.11ax	2mm	Right	6825	14.28	14.50	1.05	100%	1.00	2.32	---	2.44	---
802.11ax	λ/5	Right	6825	14.28	14.50	1.05	100%	1.00	2.14	---	2.25	---

2mm Separation Distance				Meas power(dBm)	Tune-up (dBm)	Scaling factor	Duty cycle	Duty factor	Meas. PD(w/m2)		Report PD(w/m2)	
WLAN6GHz UNII-8	Exposure condition	Position	Frequency (MHz)						First	Second	First	Second
802.11ax	2mm	Right	6985	14.17	14.50	1.08	100%	1.00	3.15	---	3.40	---
802.11ax	λ/5	Right	6985	14.17	14.50	1.08	100%	1.00	2.90	---	3.13	---

Modified prototype

2mm Separation Distance				Meas power(dBm)	Tune-up (dBm)	Scaling factor	Duty cycle	Duty factor	Meas. PD(w/m²)		Report PD(w/m²)	
WLAN6GHz UNII-6	Exposure condition	Position	Frequency (MHz)						First	Second	First	Second
802.11ax	2mm	Right	6505	13.68	14.00	1.08	100%	1.00	1.88	---	2.03	---
802.11ax	λ/5	Right	6505	13.68	14.00	1.08	100%	1.00	1.73	---	1.87	---

Note1: Radio= iPDn(2mm)/iPDn(λ/5) <1, So DASY is stable with advanced ESR method by using software version higher than 3.0.

7 MEASUREMENT UNCERTAINTY

PD Absolute Uncertainty Budget for System Performance Check							
Error Description		Unc. Value (±dB)	Probab. Distri.	Div.	(c_i)	Std. Unc. (±dB)	(v_i) v_{eff}
Uncertainty terms dependent on the measurement system							
CAL	Calibration Repeatability	0.21	N	1	1	0.21	∞
COR	Probe correction	0	R	$\sqrt{3}$	1	0	∞
FRS	Frequency response (BW ≤1 GHz)	0.20	R	$\sqrt{3}$	0	0	∞
SCC	Sensor cross coupling	0	R	$\sqrt{3}$	1	0	∞
ISO	Isotropy	0.30	R	$\sqrt{3}$	1	0.17	∞
LIN	Linearity	0.20	R	$\sqrt{3}$	1	0.12	∞
PSC	Probe scattering	0	R	$\sqrt{3}$	1	0	∞
PPO	Probe positioning offset	0.11	R	$\sqrt{3}$	1	0.06	∞
PPR	Probe positioning repeatability	0.04	R	$\sqrt{3}$	1	0.02	∞
SMO	Sensor mechanical offset	0	R	$\sqrt{3}$	1	0	∞
PSR	Probe spatial resolution	0	R	$\sqrt{3}$	1	0	∞
FLD	Field impedance dependence	0	R	$\sqrt{3}$	1	0	∞
APD	Amplitude and phase drift	0	R	$\sqrt{3}$	1	0	∞
APN	Amplitude and phase noise	0.04	R	$\sqrt{3}$	0	0	∞
TR	Measurement area truncation	0	R	$\sqrt{3}$	1	0	∞
DAQ	Data acquisition	0.03	N	1	1	0.03	∞
SMP	Sampling	0	R	$\sqrt{3}$	1	0	∞
REC	Field reconstruction	0.60	R	$\sqrt{3}$	0.3	0.10	∞
TRA	Forward transformation	0	R	$\sqrt{3}$	1	0	∞
SCA	Power density scaling	–	R	$\sqrt{3}$	1	0	∞
SAV	Spatial averaging	0.10	R	$\sqrt{3}$	0	0	∞
SDL	System detection limit	0.04	R	$\sqrt{3}$	1	0.02	∞
Uncertainty terms dependent on the DUT and environmental factors							
PC	Probe coupling with DUT	0	R	$\sqrt{3}$	1	0	∞
MOD	Modulation response	0.40	R	$\sqrt{3}$	0	0	∞
IT	Integration time	0	R	$\sqrt{3}$	1	0	∞
RT	Response time	0	R	$\sqrt{3}$	1	0	∞
DH	Device holder influence	0.10	R	$\sqrt{3}$	0	0	∞
DA	DUT alignment	0	R	$\sqrt{3}$	1	0	∞
AC	RF ambient conditions	0.04	R	$\sqrt{3}$	1	0.02	∞
AR	Ambient Reflections	0.04	R	$\sqrt{3}$	1	0.02	∞
MSI	Immunity / secondary reception	0	R	$\sqrt{3}$	0	0	∞
DRI	Drift of the DUT	0.10	R	$\sqrt{3}$	1	0.06	∞
Combined Standard Uncertainty						0.33	∞
Expanded Standard Uncertainty (95%)						**0.66**	

PD Absolute Uncertainty Budget for DUT Evaluations							
Error Description		Unc. Value (±dB)	Probab. Distri.	Div.	(c_i)	Std. Unc. (±dB)	(v_i) v_{eff}
Uncertainty terms dependent on the measurement system							
CAL	Calibration	0.49	N	1	1	0.49	∞
COR	Probe correction	0	R	$\sqrt{3}$	1	0	∞
FRS	Frequency response (BW ≤ 1 GHz)	0.20	R	$\sqrt{3}$	1	0.12	∞
SCC	Sensor cross coupling	0	R	$\sqrt{3}$	1	0	∞
ISO	Isotropy	0.50	R	$\sqrt{3}$	1	0.29	∞
LIN	Linearity	0.20	R	$\sqrt{3}$	1	0.12	∞
PSC	Probe scattering	0	R	$\sqrt{3}$	1	0	∞
PPO	Probe positioning offset	0.30	R	$\sqrt{3}$	1	0.17	∞
PPR	Probe positioning repeatability	0.04	R	$\sqrt{3}$	1	0.02	∞
SMO	Sensor mechanical offset	0	R	$\sqrt{3}$	1	0	∞
PSR	Probe spatial resolution	0	R	$\sqrt{3}$	1	0	∞
FLD	Field impedance dependence	0	R	$\sqrt{3}$	1	0	∞
APD	Amplitude and phase drift	0	R	$\sqrt{3}$	1	0	∞
APN	Amplitude and phase noise	0.04	R	$\sqrt{3}$	1	0.02	∞
TR	Measurement area truncation	0	R	$\sqrt{3}$	1	0	∞
DAQ	Data acquisition	0.03	N	1	1	0.03	∞
SMP	Sampling	0	R	$\sqrt{3}$	1	0	∞
REC	Field reconstruction	0.60	R	$\sqrt{3}$	1	0.35	∞
TRA	FTE/MEO	0 (0.7)	R	$\sqrt{3}$	1	0(0.4)	∞
SCA	Power density scaling	–	R	$\sqrt{3}$	1	–	∞
SAV	Spatial averaging	0.10	R	$\sqrt{3}$	1	0.06	∞
SDL	System detection limit	0.04	R	$\sqrt{3}$	1	0.02	∞
Uncertainty terms dependent on the DUT and environmental factors							
PC	Probe coupling with DUT	0	R	$\sqrt{3}$	1	0	∞
MOD	Modulation response	0.40	R	$\sqrt{3}$	1	0.23	∞
IT	Integration time	0	R	$\sqrt{3}$	1	0	∞
RT	Response time	0	R	$\sqrt{3}$	1	0	∞
DH	Device holder influence	0.10	R	$\sqrt{3}$	1	0.06	∞
DA	DUT alignment	0	R	$\sqrt{3}$	1	0	∞
AC	RF ambient conditions	0.04	R	$\sqrt{3}$	1	0.02	∞
AR	Ambient reflections	0.04	R	$\sqrt{3}$	1	0.02	∞
MSI	Immunity / secondary reception	0	R	$\sqrt{3}$	1	0	∞
DRI	Drift of the DUT	–	R	$\sqrt{3}$	1	–	∞
Combined Std Uncertainty (w/ FTE/MEO)						0.75	∞
Expanded Std Uncertainty (w/ FTE/MEO)						**1.50**	

DASY6 Module mmWave V3.0 features the Equivalent Source Reconstruction (ESR) method to compute the incident PD values averaged over an area of 1 cm2 and 4 cm2. With this method, the reconstruction uncertainty (REC) is below 0.6 dB for d > λ/25, corresponding to a test distance of 2mm at 6 GHz. The above-mentioned REC value is valid if the following conditions on the grid resolution (ℓ_{grid}) and grid extent (v_{grid}) are met:

$$\ell_{\text{grid}} = \begin{cases} 1.25d & \text{for } d < \lambda/10 \\ \lambda/8 & \text{for } d \geq \lambda/10 \end{cases}.$$

$$\nu_{\text{grid}} \geq 2\lambda$$

SRTC use Dasy6 version3 and above conditions are met, the uncertainty budgets given above can be used without any further adjustments.

Note: if test with Evaluations with PTP-PR (Software version Earlier than V3.0), The REC UNCERTAINTY must be evaluated. It is strongly recommended to use Method of ESR based on DASY6 mmWave V3.0.

PD Relative Uncertainty Budget System Performance Check							
Error Description		Unc. Value (±dB)	Probab. Distri.	Div.	(c_i)	Std. Unc. (±dB)	(v_i) v_{eff}
Uncertainty terms dependent on the measurement system							
CAL	Calibration Repeatability	0.21	N	1	0	0	∞
COR	Probe correction	0	R	$\sqrt{3}$	1	0	∞
FRS	Frequency response (BW ≤1 GHz)	0.20	R	$\sqrt{3}$	0	0	∞
SCC	Sensor cross coupling	0	R	$\sqrt{3}$	1	0	∞
ISO	Isotropy	0.30	R	$\sqrt{3}$	1	0.17	∞
LIN	Linearity	0.20	R	$\sqrt{3}$	0	0	∞
PSC	Probe scattering	0	R	$\sqrt{3}$	1	0	∞
PPO	Probe positioning offset	0.11	R	$\sqrt{3}$	1	0.06	∞
PPR	Probe positioning repeatability	0.04	R	$\sqrt{3}$	1	0.02	∞
SMO	Sensor mechanical offset	0	R	$\sqrt{3}$	1	0	∞
PSR	Probe spatial resolution	0	R	$\sqrt{3}$	1	0	∞
FLD	Field impedance dependence	0	R	$\sqrt{3}$	1	0	∞
APD	Amplitude and phase drift	0	R	$\sqrt{3}$	1	0	∞
APN	Amplitude and phase noise	0.04	R	$\sqrt{3}$	0	0	∞
TR	Measurement area truncation	0	R	$\sqrt{3}$	1	0	∞
DAQ	Data acquisition	0.03	N	1	1	0.03	∞
SMP	Sampling	0	R	$\sqrt{3}$	1	0	∞
REC	Field reconstruction	0.60	R	$\sqrt{3}$	0.15	0.05	∞
TRA	Forward transformation	0	R	$\sqrt{3}$	1	0	∞
SCA	Power density scaling	–	R	$\sqrt{3}$	1	0	∞
SAV	Spatial averaging	0.10	R	$\sqrt{3}$	0	0	∞
SDL	System detection limit	0.04	R	$\sqrt{3}$	1	0.02	∞
Uncertainty terms dependent on the DUT and environmental factors							
PC	Probe coupling with DUT	0	R	$\sqrt{3}$	1	0	∞
MOD	Modulation response	0.40	R	$\sqrt{3}$	0	0	∞
IT	Integration time	0	R	$\sqrt{3}$	1	0	∞
RT	Response time	0	R	$\sqrt{3}$	1	0	∞
DH	Device holder influence	0.10	R	$\sqrt{3}$	0	0	∞
DA	DUT alignment	0	R	$\sqrt{3}$	1	0	∞

AC	RF ambientconditions	0.04	R	$\sqrt{3}$	1	0.02	∞
AR	Ambient Reflections	0.04	R	$\sqrt{3}$	1	0.02	∞
MSI	Immunity / secondary reception	0	R	$\sqrt{3}$	0	0	∞
DRI	Drift of the DUT	0.10	R	$\sqrt{3}$	1	0.06	∞
Combined Standard Uncertainty						0.20	∞
Expanded Standard Uncertainty (95%)						**0.40**	

PD Relative Uncertainty Budget for DUT Evaluations

Error Description		Unc. Value (±dB)	Probab. Distri.	Div.	(c_i)	Std. Unc. (±dB)	(v_i) v_{eff}
Uncertainty terms dependent on the measurement system							
CAL	Calibration	0.49	N	1	0	0.0	∞
COR	Probe correction	0	R	$\sqrt{3}$	1	0	∞
FRS	Frequency response (BW ≤ 1 GHz)	0.20	R	$\sqrt{3}$	0	0.0	∞
SCC	Sensor cross coupling	0	R	$\sqrt{3}$	1	0	∞
ISO	Isotropy	0.50	R	$\sqrt{3}$	0.5	0.14	∞
LIN	Linearity	0.20	R	$\sqrt{3}$	0.5	0.06	∞
PSC	Probe scattering	0	R	$\sqrt{3}$	1	0	∞
PPO	Probe positioning offset	0.30	R	$\sqrt{3}$	0	0.0	∞
PPR	Probe positioning repeatability	0.04	R	$\sqrt{3}$	1	0.02	∞
SMO	Sensor mechanical offset	0	R	$\sqrt{3}$	1	0	∞
PSR	Probe spatial resolution	0	R	$\sqrt{3}$	1	0	∞
FLD	Field impedance dependence	0	R	$\sqrt{3}$	1	0	∞
APD	Amplitude and phase drift	0	R	$\sqrt{3}$	1	0	∞
APN	Amplitude and phase noise	0.04	R	$\sqrt{3}$	1	0.02	∞
TR	Measurement area truncation	0	R	$\sqrt{3}$	1	0	∞
DAQ	Data acquisition	0.03	N	1	1	0.03	∞
SMP	Sampling	0	R	$\sqrt{3}$	1	0	∞
REC	Field reconstruction	0.6	R	$\sqrt{3}$	0.5	0.17	∞
TRA	FTE/MEO	0 (0.7)	R	$\sqrt{3}$	0.5	0 (0.20)	∞
SCA	Power density scaling	–	R	$\sqrt{3}$	1	–	∞
SAV	Spatial averaging	0.10	R	$\sqrt{3}$	1	0.06	∞
SDL	System detection limit	0.04	R	$\sqrt{3}$	1	0.02	∞
Uncertainty terms dependent on the DUT and environmental factors							
PC	Probe coupling with DUT	0	R	$\sqrt{3}$	1	0	∞
MOD	Modulation response	0.40	R	$\sqrt{3}$	1	0.23	∞
IT	Integration time	0	R	$\sqrt{3}$	1	0	∞
RT	Response time	0	R	$\sqrt{3}$	1	0	∞
DH	Device holder influence	0.10	R	$\sqrt{3}$	0	0.0	∞
DA	DUT alignment	0	R	$\sqrt{3}$	1	0	∞
AC	RF ambientconditions	0.04	R	$\sqrt{3}$	1	0.02	∞
AR	Ambient reflections	0.04	R	$\sqrt{3}$	1	0.02	∞
MSI	Immunity / secondary reception	0	R	$\sqrt{3}$	1	0	∞
DRI	Drift of the DUT	–	R	$\sqrt{3}$	1	–	∞
Combined Std Uncertainty (w/ FTE/MEO)						0.42	∞
Expanded Std Uncertainty (w/ FTE/MEO)						**0.84**	

According to IEC 62479, a **relative uncertainty** (expanded) of 30 % is used for a number of EMF assessment methods. Therefore this level of relative uncertainty is used as a default maximum in this generic standard. The uncertainty values specified for each EMF assessment method are the maximum allowed uncertainties. If the uncertainty value >30 %, Test result shall be corrected.

For DASY6 PD **Relative Uncertainty** Budget System Performance Check mentioned above:

Expanded Standard Uncertainty=0.4dB=1.096 numeric, 9.6%<30%. So there is no need to make the correction, and measured data adopt as final result.

For DASY6 PD **Relative Uncertainty** Budget for DUT Evaluations mentioned above:

Expanded Standard Uncertainty=0.84dB=1.213 numeric, 21.3%<30%. So there is no need to make the correction, and measured data adopt as final result.

Note: Relative uncertainty is the percentage based on reference value, it's different from absolute uncertainty. It is very important to distinguish these two items and flowing the post-processing necessary.

8 TEST EQUIPMENTS

The measurements were performed using an automated near-field scanning system, DASY, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland, all the components and supplement devices listed below.

Test Equipment	Model	Serial Number	Calibration date	Calibration due data
DAE	DAE4	546	2023/09/15	2024/09/14
mmWave probe	EUmmWV4	9533	2023/8/18	2024/8/17
Dipole Validation Kit	Verification source10GHz	2015	2021/11/29	2024/11/28
Dipole Validation Kit	Verification source30GHz	1092	2021/11/29	2024/11/28
Dipole Validation Kit	Verification source45GHz	1002	2021/11/29	2024/11/28

Test Equipment	Model	Serial Number
Signal Generator	E8257dD	MY46522016
Power meter	E4417A	MY45101004
Power Sensor	E9300B	MY41496001
Power Sensor	E9300B	MY41496003

Software	Version
cDASY6mmWave	3.0.0.841