Power Density Measurement Report

Application No.:	SZCR2403000767WM
Applicant:	Sonim Technologies, Inc.
Manufacturer:	Sonim Technologies, Inc.
EUT Description:	smartphone
Model No.:	X800
Type No.:	S6002
Trade Mark:	Sonim
FCC ID:	WYPS6002
Standards:	FCC 47CFR §2.1093
Date of Receipt:	2024/07/01
Date of Test:	2024/07/06 to 2024/07/28
Date of Issue:	2024/08/01
Test conclusion:	**PASS ***

*In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Keny Xu

EMC Laboratory Manager

Revision History

Report Number	Revision	Description	Issue Date
SZCR240300076713	01	Original	2024/08/01

Authorized for issue by:				
		Calvin Weng / Project Engineer		
		Eric Fu / Reviewer		

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TEST SUMMARY

Frequency Band	Measured PD(W/m^2)	Reported PD (W/m^2)
n260	4.83	9.73
n261	4.89	9.73
PD Limit	10.0	

CONTENTS

1 General Information

1.1 Details of Client

Applicant:	Sonim Technologies, Inc.
Address:	4445 Eastgate Mall, Suite 200, San Diego, CA 92121, USA
Manufacturer:	Sonim Technologies, Inc.
Address:	4445 Eastgate Mall, Suite 200, San Diego, CA 92121, USA

1.2 Test Location

Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China
Post code:	518057
Test Engineer:	Vito Wang

1.3 General Description of EUT

Device Type :	portable device		
Exposure Category:	uncontrolled environment / general population		
Product Name:	smartphone		
Model No.(EUT):	X800		
FCC ID:	WYPS6002		
Trade Mark:	Sonim		
Product Phase:	production unit		
IMEI:	351348280016666,351348280016633, 351348280016880		
Hardware Version:	V1.0		
Software Version:	X80.0-01-14.0-15.26.00		
Antenna Type:	PCB Antenna		
Modulation Mode:	**5G NR**:DFT-s-OFDM(PI/2 BPSK,QPSK,16QAM,64QAM,256QAM) CP-OFDM(QPSK,16QAM,64QAM,256QAM)		
Frequency Bands:	Band	Tx (MHz)	Rx (MHz)
	n260	34000~43000	34000~43000
	n261	27500~28350	27500~28350
Note: *Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, SGS is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion. Remark: As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.			

1.4 Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radiofrequency Radiation Exposure Evaluation: Portable Devices
ANSI/IEEE C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 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

1.5 RF exposure limit for above 6GHz

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Peak Spatially Averaged Power Density was evaluated over a circular area of 4cm2 per interim FCC Guidance for near-field power density evaluations per October 2018 TCB Workshop notes

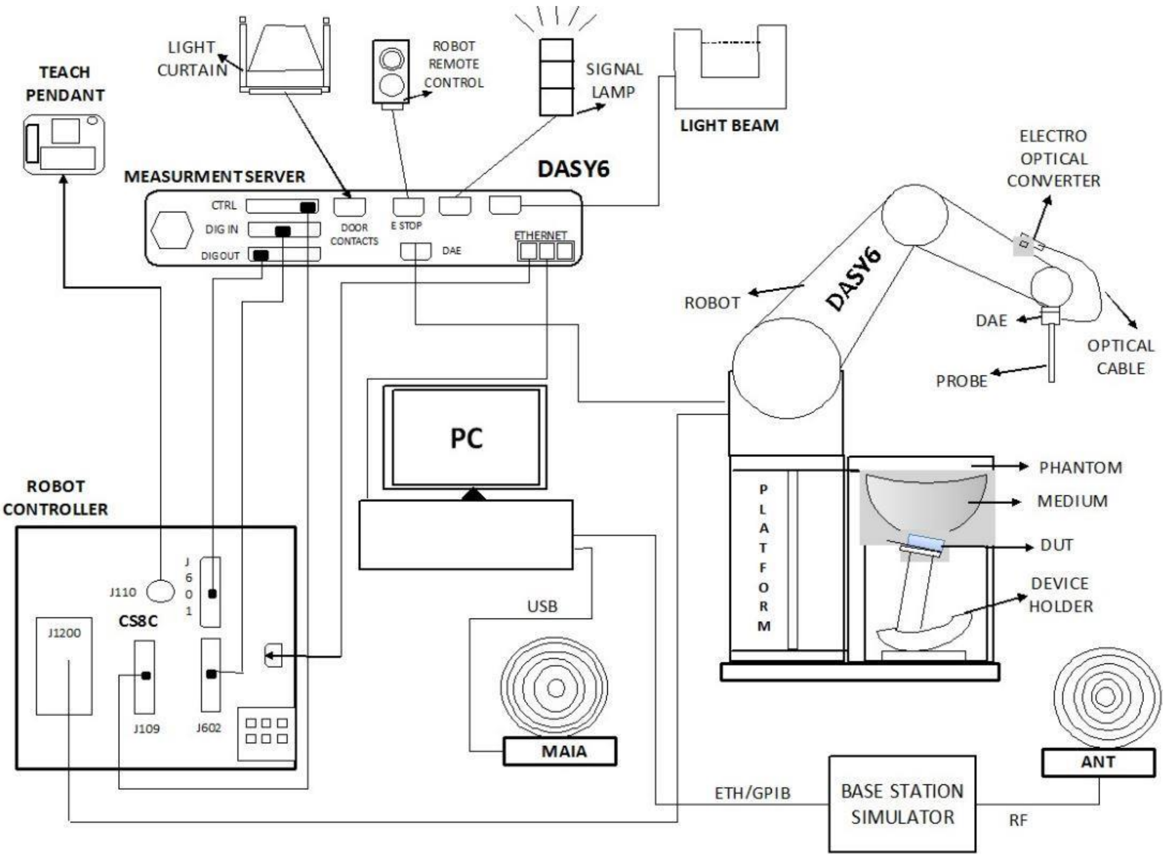
Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

Note: 1.0 mW/cm^2 is equal to 10 W/m^2

2 System Description and Setup

2.1 Power density measurement system

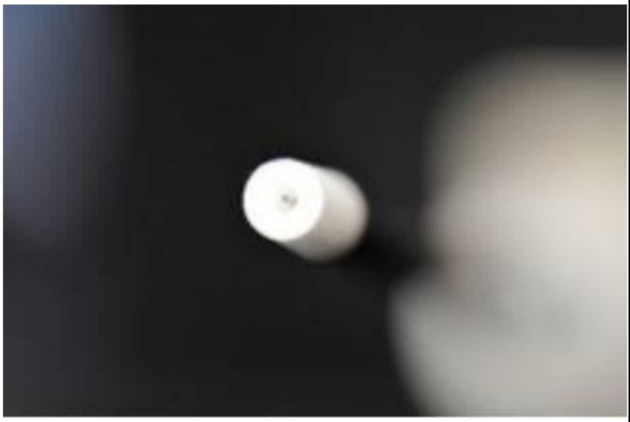
Power density measurements for mmWave frequencies were performed using SPEAG DASY6 with cDASY6 5G module. The DASY6 included a high precision robotics system (Staubli), robot controller, desktop computer, near-field probe, probe alignment sensor, and the 5G phantom cover.

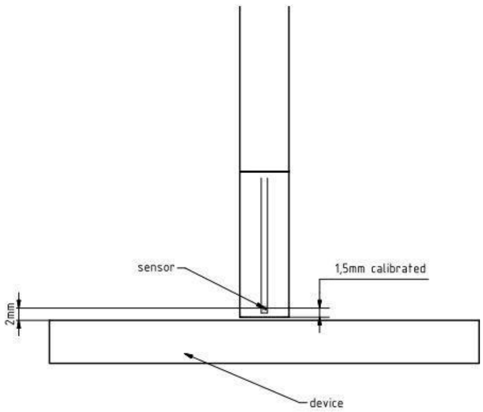


Measurement System Configuration

2.2 EUmmWaVe probe

Frequency	750 MHz – 110 GHz
Probe Overall Length	320 mm
Probe Body Diameter	8.0 mm
Tip Length	23.0 mm
Tip Diameter	8.0 mm
Probe's two dipoles length	0.9 mm – Diode loaded
Dynamic Range	< 20 V/m - 10000 V/m with PRE-10 (min < 50 V/m - 3000 V/m)
Position Precision	< 0.2 mm
Distance between diode sensors and probe's tip	1.5 mm
Minimum Mechanical separation between probe tip and a Surface	0.5 mm
Applications	E-field measurements of 5G devices and other mm-wave transmitters operating above 10GHz in < 2 mm distance from device (free-space) Power density, H-field and far-field analysis using total field reconstruction.
Compatibility	cDASY6 + 5G-Module SW1.0 and higher

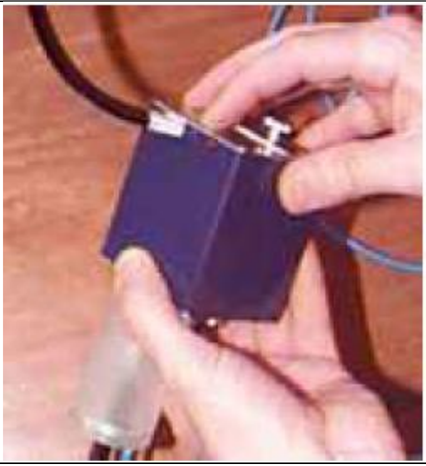




The EUmmWaVe probe is based on the pseudo-vector probe design, which not only measures the field magnitude but also derives its polarization ellipse. The design entails two small 0.8mm dipole sensors mechanically protected by high-density foam, printed on both sides of a 0.9mm wide and 0.12mm thick glass substrate. The body of the probe is specifically constructed to minimize distortion by the scattered fields. The probe consists of two sensors with different angles (1 and 2) arranged in the same plane in the probe axis. Three or more measurements of the two sensors are taken for different probe rotational angles to derive the amplitude and polarization information. The probe design allows measurements at distances as small as 2mm from the sensors to the surface of the device under test (DUT). The typical sensor to probe tip distance is 1.5 mm. The exact distance is calibrated.

Data Acquisition Electronics (DAE)

Model	DAE
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.
Measurement Range	-100 to +300 mV (16-bit resolution and two range settings: 4mV,400mV)
Input Offset Voltage	< 5μV (with auto zero)
Input Bias Current	< 50 f A
Dimensions	60 x 60 x 68 mm



2.3 Scan configuration

Fine-resolution scans on 2 different planes are performed to reconstruct the E- and H-fields as well as the power density; the z-distance between the 2 planes is set to λ/4. The (x, y) grid step is also setλ/4, the grid extent is set to sufficiently large to identify the field pattern and the peak.

3 System Verification Procedure

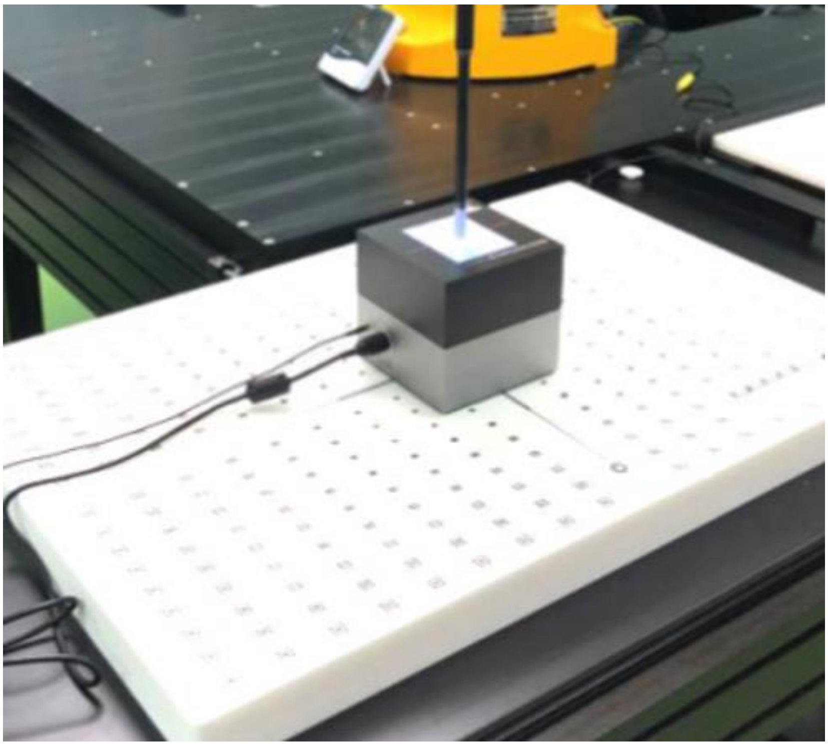
3.1 PD Test System Verification

The system was verified to be within ±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.

Frequency [GHz]	Grid step	Grid extent X/Y [mm]	Measurement points
10	0.25 ($\frac{\lambda}{4}$)	120/120	16 × 16
30	0.25 ($\frac{\lambda}{4}$)	60/60	24 × 24
60	0.25 ($\frac{\lambda}{4}$)	32.5/32.5	26 × 26
90	0.25 ($\frac{\lambda}{4}$)	30/30	36 × 36

Settings for measurement of verification sources



System Verification Setup Photo

3.2 PD System Verification Results

Frequent	Measured PD W/m²	Target PD W/m²	Circular Deviation (Within ±0.66dB)	Test Date
	4cm²	4cm²	4cm²	
30Ghz Source	34.10	33.3	0.10	2024/7/22
30Ghz Source	33.50	33.3	0.03	2024/7/23

3.3 Detailed System Check Results

Please see the Appendix A

4 Measurement Data

1. The PD test was performed of a 2mm separation between sensor and EUT surface (the probe tip is 0.5mm to the EUT surface), 2 mm separation distance PD testing is for hotspot and body worn exposure conditions.

2. According to TCBC Workshop in October 2018, 4 cm^2 averaging area are used.

3. Input power limit parameter for 5G mmW NR radio was calculated in RF Exposure Part 0 test report.

4. The device was configured to transmit CW wave signal for testing, due to Qualcomm® Smart Transmit feature, additional testing was not required for different modulations (CP-OFDM QPSK, CP-OFDM 16QAM, CP-OFDM 64QAM), RB configurations, component carriers, channel configurations (low channel, mid channel, high channel). The validation of the time-averaging algorithm and compliance under the Tx varying transmission scenario for WWAN technologies are reported in Part 2 report.

5. From the Part 0 and simulation report, beam IDs with highest PD and corresponding input power limit were selected to be tested for each antenna module and for each frequency band. Power density measurements were performed with DUT transmitting at input.power.limit for one single beam for each polarization (H & V) and one beam-pair, for each antenna type and for each antenna module on the worst-surfaces.

6. It's illustrated in Part 0 report that, for 5G mmW NR since there is total design-related uncertainty arising from TxAGC and device-to-device variation, the worst-case RF exposure should be determined by accounting for this device total uncertainty of 2.1 dB, as well as PD design target of 6.0W/m2. Therefore, 5G mmW NR RF exposure for this DUT is evaluated by reported PD calculated as: Reported PD=PD design target + 2.1 dB =9.73 W/m2 = 0.973 mW/cm^2

7. The 2nd generation of Smart Transmit (GEN2) operates based on pre-defined sub6 antenna groups (AG) and mmW module groups (MG) and was implemented on this device
   - Per QC's guidance, for simultaneous TER analysis, the device needs to demonstrate that combined PD for these identified PD beams at each QTM's dominant surface are less than PD_design_target+total uncertainty. However, in this device, the 2 QTM modules are in physically separated devices, and each QTM module has its own PD evaluation planes, unlike conventional devices where the QTM modules are collocated in the same physical device and share the same PD evaluation plane.
   - Since the 2 QTM modules have different RF exposure conditions, the combined PD doesn't apply here. Hence, there's no need for additional verifications for Smart Transmit Gen 2 mmWave favor mode.

8. The device integrates the proximity sensor, and when the FrontPod sensor is be triggered, the mmWave module 0 would be disabled; therefore, PD for the front surface of FrontPod mmWave module was tested at proximity sensor trigger distance -1 mm.

Test DATA

Band	Antenna Module	Beam ID 1	Beam ID 2	State	Test ch./Freq. (Mhz)	Exposure Surface	Power Setting	Input power level(dBm)	Test Separation	Measured results Savg tot 4cm^2 (W/m2)
n260	Module 0	18	/	/	2254166/38500	Right Side	26	2.61	2mm	4.11
n260	Module 0	/	142	/	2254166/38500	Right Side	26	2.56	2mm	4.83
n260	Module 0	2	/	/	2254166/38500	Right Side	88	8.76	2mm	3.77
n260	Module 0	13	141	TAV on	2254166/38500	Right Side	-8	-0.81	2mm	2.34
n260	Module 0	13	141	TAV off	2254166/38500	Right Side	-8	-0.81	2mm	2.84

Band	Antenna Module	Beam ID 1	Beam ID 2	State	Test ch./Freq. (Mhz)	Exposure Surface	Power Setting	Input power level(dBm)	Test Separation	Measured results Savg tot 4cm^2 (W/m2)
n261	Module 0	15	/	/	2077916/27925	Right Side	24	2.35	2mm	4.89
n261	Module 0	/	147	/	2077916/27925	Right Side	22	2.16	2mm	4.24
n261	Module 0	0	/	/	2077916/27925	Right Side	95	9.47	2mm	4.06
n261	Module 0	12	140	TAV on	2077916/27925	Right Side	-14	-1.36	2mm	2.56
n261	Module 0	12	140	TAV off	2077916/27925	Right Side	-14	-1.36	2mm	2.78

5 5G NR + LTE + WLAN + BT Sim-Tx analysis

In 5G NR + LTE + WLAN + BT simultaneous transmission, 5G NR and LTE transmission are managed and controlled by Qualcomm® Smart Transmit, while the RF exposure from WLAN and BT radios is managed using legacy approach, i.e., through a fixed power back-off if needed.

Since WLAN and BT do not employ time-averaging, 1gSAR and 10gSAR measurement for WLAN and BT need to be conducted at their corresponding rated power following current FCC test procedures to determine reported SAR values.

Smart Transmit current implementation assumes hotspots from 5G NR and LTE are collocated.

Therefore, for a total of 100% exposure margin, if LTE uses x%, then the exposure margin left for 5G NR is capped to (100-x)%. Thus, the compliance equation for LTE + 5G NR is

$$x\% * A + (100-x)\% * B \leq 1.0,$$

Where, A is normalized reported time-averaged SAR exposure ratio from LTE, and A ≤ 1.0; B is normalized reported time-averaged exposure ratio from 5G NR (i.e., PD exposure for mmW NR or SAR exposure for sub6 NR), and B ≤1.0.

Let C = normalized reported SAR exposure ratio from WLAN+BT, then for compliance,

$$x\% * A + (100-x)\% * B + C \leq 1.0 \qquad (1)$$

$$x\% * A + (100-x)\% * B \leq x\% * \max(A, B) + (100-x)\% * \max(A, B) \leq \max(A, B)$$

$$x\% * A + (100-x)\% * B + C \leq \max(A, B) + C \leq 1.0 \qquad (2)$$

if A + C ≤ 1.0 and B + C ≤ 1.0 can be proven, then “x% * A + (100-x)% * B + C ≤ 1.0”. Therefore, simultaneous transmission analysis for 5G NR + LTE + WLAN + BT can be performed in two steps

Step 1: Prove total exposure ratio (TER) of LTE + WLAN + BT < 1
Step 2: Prove total exposure ratio (TER) of 5G NR + WLAN + BT < 1

Else, if A + C > 1.0 and/or B + C > 1.0, then the followings need to hold true for compliance:

i. A and C are decoupled based on the SPLSR criteria, and
ii. (100-x)% * B + C ≤ 1.0, and
iii. x% * A + (100-x)% * B ≤ 1.0

Note iii. is covered in Part 2 report; i. and ii. should be addressed in Part 2 report.

Step 1: it’s justified in Part 1 SAR report
Step 2: it’s justified in section 12.1

Smart Transmit EFS version 16 (or higher) with back off in WWAN/FR2 when WLAN/BT is ON:

Smart Transmit EFS version 16 (or higher) provides the option to backoff WWAN radio when WLAN/BT ON. This WWAN/FR2 backoff can be configured per tech/band/antenna (or mmW module)/DSI of WWAN radios. The analysis performed above in this section is still applicable after applying the backoff to WWAN radio exposures, i.e., **A**, **and B** should be replaced as shown below:

normalized exposure of WWAN primary radio: A → replaced with "A * 10^(-WWAN backoff in dB for A when WLAN/BT ON)/10".

normalized exposure of 5GNR secondary radio: B → replaced with "B * 10^(-WWAN backoff in dB for B when WLAN/BT ON)/10".

5.1 Simultaneous-Tx analysis

No.	Simultaneous Tx Combination	Head	Body	Hotspot	Limbs
1	WWAN+WIFI2.4G	Yes	Yes	Yes	Yes
2	WWAN+BT	Yes	Yes	Yes	Yes
3	WWAN+WIFI5G	Yes	Yes	Yes	Yes
4	WWAN + WLAN 5G/6E(chain 0) + BT(chain 0)	Yes	Yes	Yes	Yes
5	WWAN + WLAN 5G/6E(chain 1) + BT(chain 0)	Yes	Yes	Yes	Yes
6	WWAN + WLAN 5G/6E MIMO + BT(chain 0)	Yes	Yes	Yes	Yes
7	WWAN + WLAN 5G/6E(chain 0) + BT(chain 1)	Yes	Yes	Yes	Yes
8	WWAN + WLAN 5G/6E(chain 1) + BT(chain 1)	Yes	Yes	Yes	Yes
9	WWAN + WLAN 5G/6EMIMO + BT(chain 1)	Yes	Yes	Yes	Yes

General Note:

1. Following the analysis in Section 11, the simultaneous transmission compliance can be justified from LTE + WiFi/BT (which is addressed in Part 1 SAR report), and FR2 + WiFi/BT which is addressed in this section. WiFi and Bluetooth SAR test results are referenced from Part 1 SAR report of FCC ID: WYPS6002(SGS Report number: SZCR240300076714)

2. To evaluate the simultaneous transmission compliance of SAR and PD, the following calculation is used:.
The [Σ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg] + [Σ of MPE ratios] is ≤ 1.0.

3. Considering the physical separation of Front pod and Rear pod in normal use cases, the antennas on the Front pods are deemed to have no RF exposure contribution on the Rear pod, and the opposite holds true. Therefore, the TER calculation is done on the Front pod and on the Rear pod separately.

4. For 5G mmW NR, compute reported time-averaged PD when WiFi is ON= PD_design_target * 10^(mmW device design uncertainty in dB/10)*10^(-WWAN backoff in dB /10) , and use this computed reported time-averaged PD in total exposure ratio (TER) analysis.

Frequency band	Antenna module	Backoff Level (dB)	Reported PD W/m^2 (WIFI/BT off)	Reported PD W/m^2 (WIFI/BT on)
N260	module	3.5	9.73	4.35
N261	module	3.5	9.73	4.35

5.2 Simultaneous transmission analysis for WiFi/BT + 5G NR

Head:

Band/Test position		Ratio to Limit									Summed Ratio													
		FR2 NR Max PD Ratio of limit	WiFi 2.4G Ant9 Ratio of limit	WiFi 2.4G Ant10 Ratio of limit	WiFi 2.4G MIMO Ratio of limit	WiFi 5G&WIFI 6E Ant9 Ratio of limit	WiFi 5G&WIFI 6E Ant10 Ratio of limit	WiFi 5G&WIFI 6E MIMO Ratio of limit	BT Ant9 Ratio of limit	BT Ant10 Ratio of limit														
		1	2	3	4	5	6	7	8	9	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	1+5+8	1+6+8	1+7+8	1+5+9	1+6+9	1+7+9
NR N260	Left cheek	0.435	0.181	0.003	0.198	0.266	0.104	0.258	0.292	0.004	0.616	0.438	0.633	0.701	0.539	0.693	0.727	0.439	0.993	0.831	0.984	0.704	0.543	0.696
	Left tilted	0.435	0.126	0.016	0.131	0.254	0.120	0.200	0.154	0.003	0.561	0.451	0.566	0.689	0.555	0.635	0.589	0.438	0.844	0.709	0.789	0.693	0.558	0.638
	Right cheek	0.435	0.051	0.001	0.063	0.089	0.068	0.079	0.062	0.039	0.486	0.436	0.498	0.524	0.503	0.514	0.497	0.474	0.586	0.565	0.576	0.563	0.542	0.553
	Right tilted	0.435	0.046	0.001	0.049	0.117	0.074	0.089	0.058	0.008	0.481	0.436	0.484	0.552	0.509	0.524	0.493	0.443	0.609	0.566	0.582	0.559	0.516	0.532
NR N261	Left cheek	0.435	0.181	0.003	0.198	0.266	0.104	0.258	0.292	0.004	0.616	0.438	0.633	0.701	0.539	0.693	0.727	0.439	0.993	0.831	0.984	0.704	0.543	0.696
	Left tilted	0.435	0.126	0.016	0.131	0.254	0.120	0.200	0.154	0.003	0.561	0.451	0.566	0.689	0.555	0.635	0.589	0.438	0.844	0.709	0.789	0.693	0.558	0.638
	Right cheek	0.435	0.051	0.001	0.063	0.089	0.068	0.079	0.062	0.039	0.486	0.436	0.498	0.524	0.503	0.514	0.497	0.474	0.586	0.565	0.576	0.563	0.542	0.553
	Right tilted	0.435	0.046	0.001	0.049	0.117	0.074	0.089	0.058	0.008	0.481	0.436	0.484	0.552	0.509	0.524	0.493	0.443	0.609	0.566	0.582	0.559	0.516	0.532

10mm:

Band/Test position		Ratio to Limit									Summed Ratio													
		FR2 NR Max PD Ratio of limit	WiFi 2.4G Ant9 Ratio of limit	WiFi 2.4G Ant10 Ratio of limit	WiFi 2.4G MIMO Ratio of limit	WiFi 5G&WIFI 6E Ant9 Ratio of limit	WiFi 5G&WIFI 6E Ant10 Ratio of limit	WiFi 5G&WIFI 6E MIMO Ratio of limit	BT Ant9 Ratio of limit	BT Ant10 Ratio of limit														
		1	2	3	4	5	6	7	8	9	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	1+5+8	1+6+8	1+7+8	1+5+9	1+6+9	1+7+9
NR N260	Front side	0.435	0.231	0.023	0.171	0.084	0.047	0.063	0.060	0.061	0.666	0.458	0.606	0.519	0.482	0.498	0.495	0.496	0.579	0.542	0.558	0.579	0.543	0.558
	Back side	0.435	0.250	0.096	0.294	0.174	0.188	0.214	0.110	0.098	0.685	0.531	0.729	0.609	0.623	0.649	0.545	0.533	0.719	0.733	0.759	0.708	0.721	0.747
	Right side	0.435	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435
	Top side	0.435	0.213	0.052	0.001	0.110	0.074	0.120	0.069	0.076	0.648	0.487	0.436	0.545	0.509	0.555	0.504	0.511	0.614	0.578	0.624	0.621	0.586	0.631
NR N261	Front side	0.435	0.231	0.023	0.171	0.084	0.047	0.063	0.060	0.061	0.666	0.458	0.606	0.519	0.482	0.498	0.495	0.496	0.579	0.542	0.558	0.579	0.543	0.558
	Back side	0.435	0.250	0.096	0.294	0.174	0.188	0.214	0.110	0.098	0.685	0.531	0.729	0.609	0.623	0.649	0.545	0.533	0.719	0.733	0.759	0.708	0.721	0.747
	Right side	0.435	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435
	Top side	0.435	0.213	0.052	0.001	0.110	0.074	0.120	0.069	0.076	0.648	0.487	0.436	0.545	0.509	0.555	0.504	0.511	0.614	0.578	0.624	0.621	0.586	0.631

0mm:

Band/Test position		Ratio to Limit									Summed Ratio													
		FR2 NR Max PD Ratio of limit	WiFi 2.4G Ant9 Ratio of limit	WiFi 2.4G Ant10 Ratio of limit	WiFi 2.4G MIMO Ratio of limit	WiFi 5G&WIFI 6E Ant9 Ratio of limit	WiFi 5G&WIFI 6E Ant10 Ratio of limit	WiFi 5G&WIFI 6E MIMO Ratio of limit	BT Ant9 Ratio of limit	BT Ant10 Ratio of limit														
		1	2	3	4	5	6	7	8	9	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	1+5+8	1+6+8	1+7+8	1+5+9	1+6+9	1+7+9
NR N260	Right Side	0.435	0.100	0.039	0.167	0.211	0.220	0.329	0.044	0.039	0.535	0.474	0.602	0.646	0.655	0.764	0.479	0.474	0.690	0.699	0.808	0.685	0.694	0.803
NR N261	Right Side	0.435	0.100	0.039	0.167	0.211	0.220	0.329	0.044	0.039	0.535	0.474	0.602	0.646	0.655	0.764	0.479	0.474	0.690	0.699	0.808	0.685	0.694	0.803

6 Equipment list

Test Platform		SPEAG DASY Professional				
Description		PD Test System				
Software Reference		cDASY6 V2.2.0.76				
Hardware Reference						
Equipment		Manufacturer	Model	Inventory No.	Calibration Date	Due date of calibration
☒	Phantom	SPEAG	mmWave Phantom	SZ-WSR-A-029	NCR	NCR
☒	DAE	SPEAG	DAE4	SZ-WSR-M-031	2024-03-18	2025-03-17
☒	E-U Probe	SPEAG	EUmmWV4	SZ-WSR-M-048	2023-08-18	2024-08-17
☒	5G Verification Source	SPEAG	30GHz	SZ-WSR-M-050	2023-08-21	2024-08-20
☒	Humidity and Temperature Indicator	CHIGAO	HTC-1	SZ-WSR-M-012	2024-05-28	2025-05-27

7 Measurement Uncertainty

a	b	c	d	e	f=b*e/d	g
Error Description	**Uncertainty Value (±dB)**	**Probability**	**Div.**	**Ci**	**Standard Uncertainty (±dB)**	**Vi (Veff)**
Probe Calibration	0.49	N	1	1	0.49	∞
Probe correction	0.00	R	1.732	1	0.00	∞
Frequency response (BW ≤1 GHz)	0.20	R	1.732	1	0.12	∞
Sensor cross coupling	0.00	R	1.732	1	0.00	∞
Isotropy	0.50	R	1.732	1	0.29	∞
Linearity	0.20	R	1.732	1	0.12	∞
Probe scattering	0.00	R	1.732	1	0.00	∞
Probe positioning offset	0.30	R	1.732	1	0.17	∞
Probe positioning repeatability	0.04	R	1.732	1	0.02	∞
Sensor mechanical offset	0.00	R	1.732	1	0.00	∞
Probe spatial resolution	0.00	R	1.732	1	0.00	∞
Field impedance dependance	0.00	R	1.732	1	0.00	∞
Amplitude and phase drift	0.00	R	1.732	1	0.00	∞
Amplitude and phase noise	0.04	R	1.732	1	0.02	∞
Measurement area truncation	0.00	R	1.732	1	0.00	∞
Data acquisition	0.03	N	1	1	0.03	∞
Sampling	0.00	R	1.732	1	0.00	∞
Field reconstruction	2.00	R	1.732	1	1.15	∞
Forward transformation	0.00	R	1.732	1	0.00	∞
Power density scaling	0.00	R	1.732	1	0.00	∞
Spatial averaging	0.10	R	1.732	1	0.06	∞
System detection limit	0.04	R	1.732	1	0.02	∞
Probe coupling with DUT	0.00	R	1.732	1	0.00	∞
Modulation response	0.40	R	1.732	1	0.23	∞
Integration time	0.00	R	1.732	1	0.00	∞
Response time	0.00	R	1.732	1	0.00	∞
Device holder influence	0.10	R	1.732	1	0.06	∞
DUT alignment	0.00	R	1.732	1	0.00	∞
RF ambient conditions	0.04	R	1.732	1	0.02	∞
Ambient reflections	0.04	R	1.732	1	0.02	∞
Immunity / secondary reception	0.00	R	1.732	1	0.00	∞
Drift of the DUT		R	1.732	1	0.00	∞
Combined Std. Uncertainty					1.33	
Expanded STD Uncertainty (95%)，K=2					2.67	

8 Calibration certificate

Please see the Appendix C

9 Photographs

Please see the Appendix D

Appendix A: Detailed System Check Results

Appendix B: Detailed Test Results

Appendix C: Calibration certificate

Appendix D: Photographs

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