Testing and Certification

# TEST REPORT

## Power Density Test for certification of SM-F741U

**APPLICANT**
**Samsung Electronics. Co., Ltd.**

**REPORT NO.**
**HCT-SR-2404-FC005**

**DATE OF ISSUE**
**Apr. 26, 2024**

**Tested by**
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# TEST REPORT

FCC Part 1 PD Test for certification

REPORT NO.
**HCT-SR-2404-FC005**

DATE OF ISSUE
**Apr. 26, 2024**

FCC ID
**A3LSMF741U**

| | |
|---|---|
| Applicant | **SAMSUNG Electronics Co., Ltd**<br>**129, Samsung-ro, Yeongtong-gu, Suwon-Si, Gyeonggi-do, 16677, Korea** |
| Product Name<br>Model Name<br>Additional Model Name | **Mobile Phone**<br>**SM-F741U**<br>**SM-F741U1** |
| Date of Test | **Apr. 12, 2024 ~ Apr. 23, 2024** |
| Location of Test | ■ **Permanent Testing Lab** □ **On Site Testing Lab**<br>**(Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si,** |
| FCC Rule Part(s) | **CFR §2.1093** |
| Test Results | **PASS (Power Density Limit : 1.0 ㎽/㎠)** |

| Band & Mode | Frequency Range [MHz] | Measured psPD mW /cm² | Reported psPD mW /cm² |
|---|---|---|---|
| n258 | 24250 - 24450, 24750 ~ 25 250 | 0.511 | 0.977 |
| n261 | 27500 - 28350 | 0.575 | 0.977 |
| n260 | 37000 - 40000 | 0.692 | 0.977 |
| Total exposure Ratio | **0.979** | | |

## REVISION HISTORY

The revision history for this test report is shown in table.

| Revision No. | Date of Issue | Description |
|---|---|---|
| 0 | Apr. 26, 2024 | Initial Release |
| | | |
| | | |

## Notice

| Content |
|---|
| The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated.<br>The test results have only been applied with the test methods required by the standard(s).<br>The laboratory is not accredited for the test results marked *.<br>Information provided by the applicant is marked **.<br>Test results provided by external providers are marked ***.<br><br>When confirmation of authenticity of this test report is required, please contact www.hct.co.kr<br><br>The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA). |

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# 1. Test Location

## 1.1 Test Laboratory

| | |
|---|---|
| **Company Name** | HCT Co., Ltd. |
| **Address** | 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA |
| **Telephone** | 031-645-6300 |
| **Fax.** | 031-645-6401 |

## 1.2 Test Facilities

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

| | |
|---|---|
| **Korea** | National Radio Research Agency (Designation No. KR0032) |
| | KOLAS (Testing No. KT197) |

# 2. Information of the EUT

| | |
|---|---|
| **Model Name** | SM-F741U |
| **Additional Model Name** | SM-F741U1 |
| **Equipment Type** | Mobile Phone |
| **FCC ID** | A3LSMF741U |
| **Application Type** | Certification |
| **Applicant** | SAMSUNG Electronics Co., Ltd. |

## 2.1 NR FR2 Device Description.

| Item. | | | Description | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency Range | | NR Band n258 | 24 250 ㎒ ~ 24 450 ㎒; 24 750 ㎒ ~ 25 250 ㎒ | | | | | |
| | | NR Band n260 | 37 000 ㎒ – 40 000 ㎒ | | | | | |
| | | NR Band n261 | 27 000 ㎒ – 28 500 ㎒ | | | | | |
| Channel Bandwidths | | NR Band n258 | 50 ㎒, 100 ㎒ | | | | | |
| | | NR Band n260 | 50 ㎒, 100 ㎒ | | | | | |
| | | NR Band n261 | 50 ㎒, 100 ㎒ | | | | | |
| **Ch. No.& Freq** | | **Low channel** | | **Middle channel** | | **High Channel** | | |
| | | **Channel** | **Frequency** | **Channel** | **Frequency** | **Channel** | **Frequency** |
| NR Band n261 | 100 ㎒ | 2071667 | 27550.08 | 2077915 | 27924.96 | 2084165 | 28299.96 |
| | 50 ㎒ | 2071249 | 27525 | 2077915 | 27924.96 | 2084581 | 28324.92 |
| NR Band n260 | 100 ㎒ | 2229999 | 37050 | 2254165 | 38499.96 | 2278331 | 39949.92 |
| | 50 ㎒ | 2229853 | 37025.04 | 2254165 | 38499.96 | 2278749 | 39975 |
| NR Band n258 | 100 ㎒ | 2018333 | 24350.04 | 2025833 | 24800.04 | 2032499 | 25200 |
| | 50 ㎒ | 2018333 | 24350.04 | 2025417 | 24775.08 | 2032915 | 25224.96 |
| Subcarrier Spacing (㎑) | | | 120 | | | | |
| Total Number of Supported Uplink CCs (SISO) | | | 4 (DFT-s-OFDM, CP-OFDM) | | | | |
| Total Number of Supported Uplink CCs (MIMO) | | | 4 (DFT-s-OFDM, CP-OFDM) | | | | |
| Modulations Supported in UL | | | DFT-S-OFDM: Pi/2 BPSK, QPSK,16QAM, 64QAM<br>CP-OFDM: QPSK, 16QAM, 64QAM | | | | |
| LTE Anchor Bands (n260) | | | LTE Band 2/5/12/13/14/30/48/66 | | | | |
| LTE Anchor Bands (n261) | | | LTE Band 2/4/5/12/13/48/66 | | | | |
| LTE Anchor Bands (n258) | | | LTE Band 2/5/12/66/71 | | | | |
| NR FR1 Anchor Bands (n258) | | | NR Band n2/12/25/41/66/77 | | | | |
| NR FR1 Anchor Bands (n260) | | | NR Band n2/5/12/25/30/41/48/66/77 | | | | |
| NR FR1 Anchor Bands (n261) | | | NR Band n2/5/25/41/48/66/77 | | | | |
| Duplex Type (mmWave) | | | TDD | | | | |
| Device Serial Numbers | | | XCJ1368M | | | | |
| | | | The manufacturer has confirmed that the devices tested have the same physical, mechanical and thermal characteristics are within operational tolerances expected for production units. | | | | |

## 2.2 Time-Averaging Algorithm for RF Exposure Compliance

The device is enabled with Qualcomm® Smart Transmit (GEN2) feature. This feature performs time averaging algorithm in real time to control and manage transmitting power and ensure the time-averaged RF exposure is in compliance with FCC requirements all the time.

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of SAR_design_target or PD_design_target, below the predefined time-averaged power limit (i.e., Plimit for sub-6 radio, and input.power.limit for 5G mmW NR), for each characterized technology and band (see Part 0 PD Report).

Smart Transmit allows the device to transmit at higher power instantaneously when needed, but manages power limiting to maintain time-averaged transmit power to input.power.limit. The purpose of this report (Part 1 test) is to demonstrate that the EUT meets FCC PD limits when transmitting in static transmission scenario at maximum allowable time-averaged power level given by input.power.limit

| Power density Design Target and Uncertainty | |
|---|---|
| *PD_design_target* (mW/m²) | 0.631 |
| Design Related Total Uncertainty (dB) | 2 |

## 2.3 Test Regulations

November 2017, October 2018, April 2019, November 2019 TCBC Workshop Notes

SPEAG DASY6 System Handbook (September 2019)

IEC TR 63170:2018

FCC KDB 865664 D02 v01r02

FCC KDB 447498 D01 v06

## 2.4 DUT Antenna Locations

The device has one patch antenna arrays (K Patch). Tablebelow indicates the surfaces evaluated for part 1 near field power density evaluation.

5G mmWave NR Device Surfaces

| Band | Antenna | Condition | Rear (S2) | Front (S1) | Left (S3) | Right (S4) | Bottom (S6) | Top (S5) |
|---|---|---|---|---|---|---|---|---|
| NR n261 | Patch K | Open | No | Yes | Yes | No | No | No |
| NR n260 | Patch K | Open | Yes | No | Yes | No | No | No |
| NR n258 | Patch K | Open | Yes | Yes | Yes | No | No | No |
| NR n261 | Patch K | Closed | No | No | Yes | No | No | No |
| NR n260 | Patch K | Closed | No | No | Yes | No | No | No |
| NR n258 | Patch K | Closed | No | Yes | Yes | No | No | No |

Note:
1. All test configurations are based on front position view.
2. Additional surfaces were evaluated for simultaneous transmission analysis.

## 2.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds.
The device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v06 4.3.2 procedures.

| 5G mmWave NR Simultaneous Transmission Scenarios | | | | |
|---|---|---|---|---|
| **Applicable Combination** | **Head** | **Body worn** | **Wireless Router** | **Phablet** |
| LTE + 5G NR FR2 | Yes | Yes | N/A | Yes |
| LTE + 2.4 GHz WI-FI + 5G FR2 | Yes | Yes | Yes | Yes |
| LTE + 5 GHz WI-FI + 5G NR FR2 | Yes | Yes | Yes | Yes |
| LTE + 6 GHz WI-FI + 5G NR FR2 | Yes | Yes | N/A | Yes |
| LTE + 2.4 GHz Bluetooth + 5G NR FR2 | Yes^ | Yes | Yes^ | Yes |
| LTE + 2.4 GHz Bluetooth +2.4 GHz WI-FI + 5G NR FR2 | Yes^ | Yes | Yes^ | Yes |
| LTE + 2.4 GHz Bluetooth + 5 GHz WI-FI + 5G NR FR2 | Yes^ | Yes | Yes^ | Yes |
| LTE + 2.4 GHz Bluetooth + 6 GHz WI-FI + 5G NR FR2 | Yes^ | Yes | Yes^ | Yes |
| LTE + 2.4 GHz WI-FI + 5 GHz WI-FI + 5G NR FR2 | Yes | Yes | Yes | Yes |
| LTE + 2.4 GHz WI-FI + 6 GHz WI-FI + 5G NR FR2 | Yes | Yes | Yes | Yes |
| LTE + 2.4 GHz Bluetooth + 5 GHz WI-FI + 5G NR FR2 | Yes^ | Yes | Yes^ | Yes |
| LTE + 2.4 GHz Bluetooth + 6 GHz WI-FI + 5G NR FR2 | Yes^ | Yes | Yes^ | Yes |
| 5G NR FR1 + 5G NR FR2 | Yes | Yes | N/A | Yes |
| 5G NR FR1 + 2.4 GHz WI-FI + 5G FR2 | Yes | Yes | Yes | Yes |
| 5G NR FR1 + 5 GHz WI-FI + 5G NR FR2 | Yes | Yes | Yes | Yes |
| 5G NR FR1 + 6 GHz WI-FI + 5G NR FR2 | Yes | Yes | N/A | Yes |
| 5G NR FR1 + 2.4 GHz Bluetooth + 5G NR FR2 | Yes^ | Yes | Yes^ | Yes |
| 5G NR FR1 + 2.4 GHz Bluetooth +2.4 GHz WI-FI + 5G NR FR2 | Yes^ | Yes | Yes^ | Yes |
| 5G NR FR1 + 2.4 GHz Bluetooth + 5 GHz WI-FI + 5G NR FR2 | Yes^ | Yes | Yes^ | Yes |
| 5G NR FR1 + 2.4 GHz Bluetooth + 6 GHz WI-FI + 5G NR FR2 | Yes^ | Yes | Yes^ | Yes |
| 5G NR FR1 + 2.4 GHz WI-FI + 5 GHz WI-FI + 5G NR FR2 | Yes | Yes | Yes | Yes |
| 5G NR FR1 + 2.4 GHz WI-FI + 6 GHz WI-FI + 5G NR FR2 | Yes | Yes | Yes | Yes |

Note:

1. 5G NR Operations are limited to Non-Standalone (EN-DC) operations only.
2. LTE + 5G NR FR2 and 5G NR FR1 + 5G NR FR2 Scenarios are limited to EN-DC combinations with anchor bands as shown in the NR FR2 checklists
3. This device supports time averaging smart transmit algorithm in WWAN and WLAN. Smart transmit adds directly the time-averaged RF exposure from 4G/5G NR FR1/WLAN and time-averaged RF exposure from 5G mmW NR FR2 to ensure that the normalized RF exposure from both 4G/5G NR FR1/WLAN and 5G mmW NR FR2 does not exceed FCC limit.
4. NFC can transmit simultaneously with all scenarios above.
5. ^ Bluetooth Tethering is considered

# 3. Description of test equipment

## 3.1 MEASUREMENT SETUP

Peak spatially averaged power density(psPD) measurements for mmWave frequencies were performed using the DASY6 with cDASY6 5G module.
The DASY6 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of a high precision robotics system (Staubli), robot controller, desktop computer, near-field probe, probe alignment sensor, and the 5G phantom. The robot is a six-axis industrial robot, performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF).

## 3.2 SPEAG EUmmWV3 Probe / E-Field 5G Probe

The EUmmWV4 probe consists of two dipoles optimally arranged to obtain pseudo-vector information.

| | |
|---|---|
| **Frequency Range** | 750 MHz – 110 GHz |
| **Dynamic Range** | < 20 V/m – 10,000 V/m with PRE-10 (min < 50 V/m – 3,000 V/m) |
| **Position Precision** | < 0.2 mm (cDASY6) |
| **Dimensions** | Probe Overall Length: 320 mm<br>Probe Body Diameter: 8 mm<br>Probe Tip Length: 23 mm<br>Probe Tip Diameter: Encapsulation 8 mm<br>Distance from Probe Tip to Sensor X Calibration Point: 1.5 mm<br>Distance from Probe Tip to Sensor Y Calibration Point: 1.5 mm |
| **Applications** | E-field measurements of 5G devices and other mm-wave transmitters operating above 10 GHz in < 2 mm distance from device (free-space)<br>Power density, H-field and far-field analysis using total field reconstruction |
| **Compatibility** | cDASY6 + 5G-Module SW |

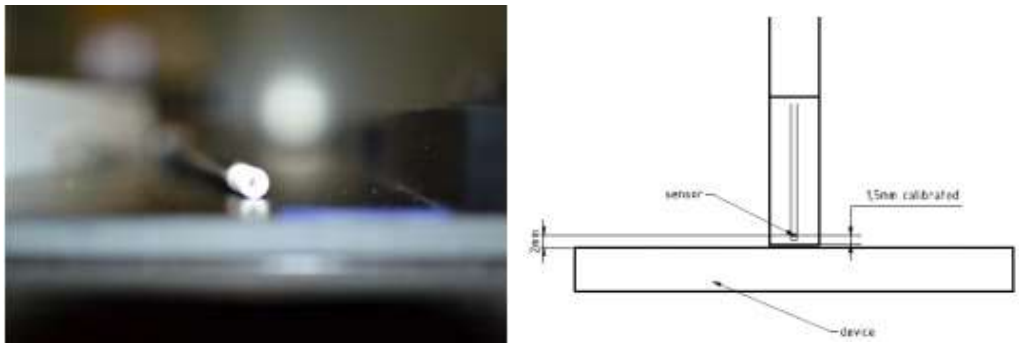



Figure 1. **EUmmWV4 Probe**

## 3.3 Peak Spatially Averaged Power Density Assessment Based on E-field Measurements

Within a short distance from the transmitting source, Power density was determined based on both electric and magnetic field. Generally, the magnitude and phase of two components of either the E-field or H-field were needed on a sufficiently large surface to fully characterized the total E-field and H-field can be used to compute power density. The general measurement approach used for this device was:

a) The local E-field on the measurement surface was measured at a reference location where the field is well above the noise level. This reference level was used at the end of this procedure to assess output power drift of the DUT during the measurement.

b) The electric field on the measurement surface was scanned. Measurements are conducted according to the instructions provided by the measurement system manufacturer. Measurement spatial resolution can depend on the measured field characteristic and measurement methodology used by the system. The planar scan step size was configured at λ/4.

c) For cDasy6, H-field was calculated from the measured E-field using a reconstruction algorithm. As the power density calculation requires knowledge of both amplitude and phase, reconstruction algorithms can also be used to obtain field information from the measured E-field data (e.g. the phase from the amplitude if only the amplitude is measured). H-field and phase data was reconstructed from repeated measurements (three per measurement point) on two measurement planes separated by λ/4.

d) The total Peak spatially averaged power density (psPD) distribution on the evaluation surface is determined per the below equation. The spatial averaging area, A, is specified by the applicable exposure limits or regulatory requirements. A circular shape was used.

$$psPD = \frac{1}{2A_{av}} \iint_{A_{av}} \|Re\{E \times H^*\}\| dA$$

e) The maximum spatial-average on the evaluation surface is the final quantity to determine compliance against applicable limits.

f) The local E-filed reference value, at the same location as step 2, was re-measured after the scan was complete to calculate the power drift. If the drift deviated by more than 5%, the power density test and drift measurements were repeated.

## 3.4 Reconstruction Algorithm

Computation of the power density in general requires menasrement information from the both E-field and H-field amplitudes and phases in the plane of incidence. Reconstruction of these quantities from pseudo-vector E-field measurements is feasible according to the manufacturer, as they are determined via Maxwells's equation. As such, the SPEAG reconstruction approach was based on the Gerchbergns. As such, the SPEAG reconstruction approach was based on the Gerchberg-Saxton algorithm, which benefits from the availability of the E-field polarzation ellipse information obtained with the EUmmWV4 probe.

# 4. RF Exposure Limits

Per §1.1310 (d)(3), the MPE limits are applied for frequencies above 6 GHz. Power Density is expressed in units of W/㎡ or ㎽/㎠.
Peak Spatially Averaged Power Density was evaluated over a circular area of 4 ㎠ per interim FCC Guidance for near-field power density evaluations per October 2018 TCB Workshop notes.

| HUMAN EXPOSURE | Limits For Occupational / Controlled Environments | Limits For General Population / Uncontrolled Environments |
|---|---|---|
| Frequency Range[㎒] | 1,500 – 100,000 | 1,500 – 100,000 |
| Power Density[㎽/㎠] | 5.0 | 1.0 |
| Average Time[Minutes] | 6 | 30 |

NOTES: 1.0 $mW/cm^2$is 10 $W/m^2$

**Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be mad fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

**Controlled Environments** are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e.as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

## 5. Input Power Specifications

All power density measurements for this device were performed at the input.power.limit given in below tables.

**Table 5-1 5G NR n258 K Patch input.power.limit**

| Antenna | Beam ID_1 | Beam ID_2 | Input.power.limit(dBm) |
|---|---|---|---|
| K Patch | 0 | | 12.5 |
| | 1 | | 9.4 |
| | 2 | | 9.6 |
| | 3 | | 9.4 |
| | 4 | | 10.1 |
| | 5 | | 5.8 |
| | 6 | | 6.7 |
| | 7 | | 5.9 |
| | 8 | | 6.7 |
| | 9 | | 9.9 |
| | 10 | | 8.8 |
| | 11 | | 6.5 |
| | 12 | | 2.7 |
| | 13 | | 2.7 |
| | 14 | | 2.3 |
| | 15 | | 2.2 |
| | 16 | | 2.0 |
| | 17 | | 2.7 |
| | 18 | | 2.7 |
| | 19 | | 2.2 |
| | 20 | | 1.8 |
| | 256 | | 13.0 |
| | 257 | | 11.4 |
| | 258 | | 12.6 |
| | 259 | | 12.2 |
| | 260 | | 12.5 |
| | 261 | | 8.2 |
| | 262 | | 9.8 |
| | 263 | | 8.7 |
| | 264 | | 9.5 |
| | 265 | | 10.9 |
| | 266 | | 9.3 |
| | 267 | | 8.6 |
| | 268 | | 9.6 |
| | 269 | | 6.4 |
| | 270 | | 6.0 |
| | 271 | | 5.8 |
| | 272 | | 4.3 |
| | 273 | | 7.3 |
| | 274 | | 6.4 |
| | 275 | | 5.6 |
| | 276 | | 4.1 |
| | 0 | 256 | 8.6 |
| | 1 | 257 | 7.0 |
| | 2 | 258 | 7.1 |
| | 3 | 259 | 6.9 |
| | 4 | 260 | 7.2 |
| | 5 | 261 | 3.2 |
| | 6 | 262 | 4.1 |
| | 7 | 263 | 3.8 |
| | 8 | 264 | 4.1 |
| | 9 | 265 | 6.6 |
| | 10 | 266 | 5.9 |
| | 11 | 267 | 4.7 |
| | 12 | 268 | 1.3 |
| | 13 | 269 | 0.4 |
| | 14 | 270 | -0.1 |
| | 15 | 271 | -0.1 |
| | 16 | 272 | -0.9 |
| | 17 | 273 | 0.5 |
| | 18 | 274 | 0.4 |
| | 19 | 275 | -0.3 |
| | 20 | 276 | -1.0 |

## Table 5-3 5G NR n261 K Patch input.power.limit

| Antenna | Beam ID_1 | Beam ID_2 | Input.power.limit(dBm) |
|---|---|---|---|
| K Patch | 0 | | 8.4 |
| | 1 | | 9.6 |
| | 2 | | 9.1 |
| | 3 | | 8.7 |
| | 4 | | 9.3 |
| | 5 | | 6.4 |
| | 6 | | 5.5 |
| | 7 | | 5.6 |
| | 8 | | 6.4 |
| | 9 | | 5.8 |
| | 10 | | 5.6 |
| | 11 | | 6 |
| | 12 | | 2.2 |
| | 13 | | 2 |
| | 14 | | 1.9 |
| | 15 | | 1.4 |
| | 16 | | 2.2 |
| | 17 | | 2 |
| | 18 | | 2.2 |
| | 19 | | 1.7 |
| | 20 | | 1.8 |
| | 256 | | 12 |
| | 257 | | 10.5 |
| | 258 | | 10.5 |
| | 259 | | 10.4 |
| | 260 | | 10.6 |
| | 261 | | 8.4 |
| | 262 | | 7.3 |
| | 263 | | 7.1 |
| | 264 | | 7.9 |
| | 265 | | 7.2 |
| | 266 | | 6.9 |
| | 267 | | 7.5 |
| | 268 | | 4.2 |
| | 269 | | 3.6 |
| | 270 | | 3.7 |
| | 271 | | 3.9 |
| | 272 | | 3.1 |
| | 273 | | 3.8 |
| | 274 | | 3.7 |
| | 275 | | 3.6 |
| | 276 | | 3.3 |
| | 0 | 256 | 5.6 |
| | 1 | 257 | 6.1 |
| | 2 | 258 | 5.5 |
| | 3 | 259 | 5.6 |
| | 4 | 260 | 6.1 |
| | 5 | 261 | 3.6 |
| | 6 | 262 | 2.7 |
| | 7 | 263 | 2.9 |
| | 8 | 264 | 3.5 |
| | 9 | 265 | 3.1 |
| | 10 | 266 | 3 |
| | 11 | 267 | 3.7 |
| | 12 | 268 | -0.9 |
| | 13 | 269 | -1.1 |
| | 14 | 270 | -1.1 |
| | 15 | 271 | -1.3 |
| | 16 | 272 | -1.3 |
| | 17 | 273 | -1.1 |
| | 18 | 274 | -0.9 |
| | 19 | 275 | -1.2 |
| | 20 | 276 | -1.2 |

**Table 5-3 5G NR n260 K Patch input.power.limit**

| Antenna | Beam ID_1 | Beam ID_2 | Input.power.limit(dBm) |
|---|---|---|---|
| K Patch | 0 | | 9.7 |
| | 1 | | 9.6 |
| | 2 | | 8.9 |
| | 3 | | 9.5 |
| | 4 | | 9.7 |
| | 5 | | 6.6 |
| | 6 | | 6.9 |
| | 7 | | 6.2 |
| | 8 | | 6.2 |
| | 9 | | 7.3 |
| | 10 | | 6.7 |
| | 11 | | 6.2 |
| | 12 | | 3.5 |
| | 13 | | 4 |
| | 14 | | 3.2 |
| | 15 | | 2.6 |
| | 16 | | 2.5 |
| | 17 | | 3.3 |
| | 18 | | 4.2 |
| | 19 | | 2.9 |
| | 20 | | 2.4 |
| | 256 | | 10.6 |
| | 257 | | 9.6 |
| | 258 | | 8.7 |
| | 259 | | 8.9 |
| | 260 | | 9.3 |
| | 261 | | 6.1 |
| | 262 | | 6.5 |
| | 263 | | 6.7 |
| | 264 | | 7.1 |
| | 265 | | 6.3 |
| | 266 | | 6.7 |
| | 267 | | 6.4 |
| | 268 | | 2.6 |
| | 269 | | 3.2 |
| | 270 | | 3.2 |
| | 271 | | 2.9 |
| | 272 | | 2.5 |
| | 273 | | 2.7 |
| | 274 | | 3.3 |
| | 275 | | 3 |
| | 276 | | 2.9 |
| | 0 | 256 | 6.6 |
| | 1 | 257 | 6.3 |
| | 2 | 258 | 5.7 |
| | 3 | 259 | 5.6 |
| | 4 | 260 | 6 |
| | 5 | 261 | 3 |
| | 6 | 262 | 3.5 |
| | 7 | 263 | 3.4 |
| | 8 | 264 | 3.2 |
| | 9 | 265 | 3.3 |
| | 10 | 266 | 3.4 |
| | 11 | 267 | 3.2 |
| | 12 | 268 | -1.1 |
| | 13 | 269 | -0.4 |
| | 14 | 270 | 0 |
| | 15 | 271 | -0.8 |
| | 16 | 272 | -1.2 |
| | 17 | 273 | -0.8 |
| | 18 | 274 | -0.4 |
| | 19 | 275 | -0.7 |
| | 20 | 276 | -1 |

# 6. 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 provide by the manufacturer, per November 2017 TCBC Workshop Notes.

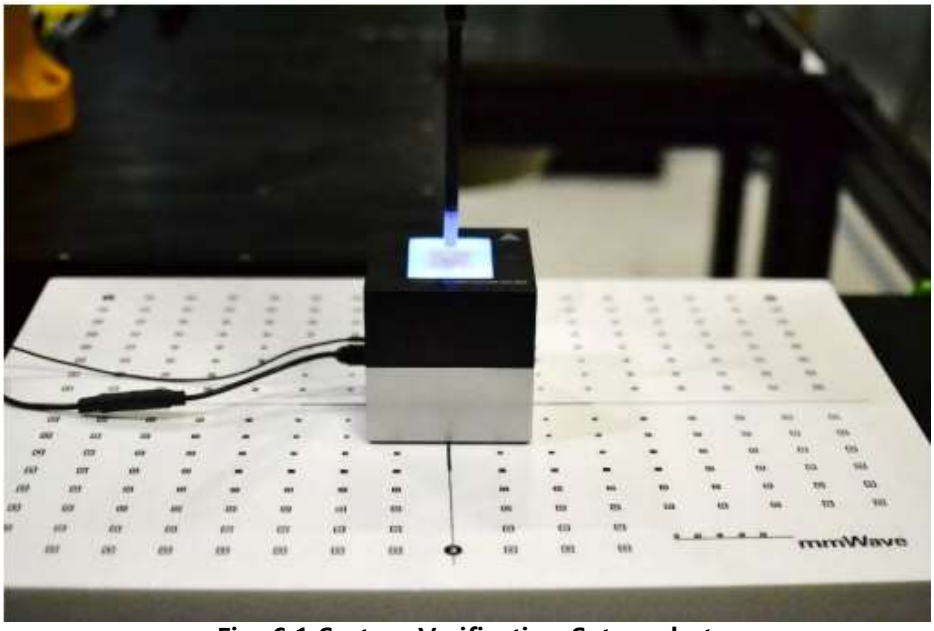



**Fig. 6.1 System Verification Setup photo**

## 6.1 System Check Results

| | System Verification | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Freq. | Date | Ambient Temp. | Source S/N | Probe S/N | Normal psPD (W/㎡ over 4 ㎠) | | Dev. | Total psPD (W/㎡ over 4 ㎠) | | Dev. |
| | (㎓) | | (℃) | | | Meas. | target | (dB) | Meas. | target | (dB) |
| Part1 | 30 | 04/12/2024 | 19.0 | 1011 | 9486 | 16.0 | 14.6 | + 0.40 | 16.3 | 14.8 | + 0.42 |
| Part1 | 30 | 04/15/2024 | 19.7 | 1011 | 9486 | 15.9 | 14.6 | + 0.37 | 16.2 | 14.8 | + 0.39 |
| Part1 | 30 | 04/16/2024 | 19.4 | 1011 | 9486 | 15.8 | 14.6 | + 0.34 | 16.0 | 14.8 | + 0.34 |
| Part1 | 30 | 04/17/2024 | 20.7 | 1011 | 9486 | 15.7 | 14.6 | + 0.32 | 16.0 | 14.8 | + 0.34 |
| Part1 | 30 | 04/18/2024 | 20.2 | 1011 | 9486 | 14.7 | 14.6 | + 0.03 | 15.0 | 14.8 | + 0.06 |
| Part1 | 30 | 04/19/2024 | 19.3 | 1011 | 9486 | 15.6 | 14.6 | + 0.29 | 15.9 | 14.8 | + 0.31 |
| NSS | 30 | 04/20/2024 | 20.5 | 1011 | 9486 | 15.7 | 14.6 | + 0.32 | 15.9 | 14.8 | + 0.31 |
| NSS | 30 | 04/22/2024 | 19.7 | 1011 | 9486 | 15.4 | 14.6 | + 0.23 | 15.6 | 14.8 | + 0.23 |
| NSS | 30 | 04/23/2024 | 19.9 | 1011 | 9486 | 15.4 | 14.6 | + 0.23 | 15.7 | 14.8 | + 0.26 |

Note: A 10mm Distance spacing was used from the reference horn antenna aperture to the probe element. This includes 4.45 mm from the reference antenna horn aperture to the surface of the verification source plus 5.55 mm from the surface to the probe. The SPEAG software requires a setting of "5.55 mm" for the correct setup

# 7. Power Density Data Summary

## 7.1 Power Density Results

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 on each worst surfaces

| n258 - Folder Open | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (mm) | (dB) | (mW/cm²) | (mW/cm²) | |
| 25 200 | 2032499 | K Patch | 15 | - | 2.2 | SISO | Rear | 2 | -0.04 | 0.156 | 0.302 | - |
| 25 200 | 2032499 | | 20 | - | 1.8 | SISO | Front | 2 | 0.15 | 0.276 | 0.359 | - |
| 25 200 | 2032499 | | 20 | - | 1.8 | SISO | Left | 2 | -0.11 | 0.287 | 0.392 | - |
| 25 200 | 2032499 | | - | 276 | 4.1 | SISO | Rear | 2 | -0.12 | 0.277 | 0.356 | - |
| 25 200 | 2032499 | | - | 271 | 5.8 | SISO | Front | 2 | -0.04 | 0.265 | 0.314 | - |
| 25 200 | 2032499 | | - | 276 | 4.1 | SISO | Left | 2 | -0.01 | **0.328** | **0.511** | 1 |
| 25 200 | 2032499 | | 20 | 276 | -1.0 | MIMO | Rear | 2 | 0.10 | 0.091 | 0.129 | - |
| 25 200 | 2032499 | | 19 | 275 | -0.3 | MIMO | Front | 2 | 0.03 | 0.170 | 0.228 | - |
| 25 200 | 2032499 | | 20 | 276 | -1.0 | MIMO | Left | 2 | -0.07 | 0.200 | 0.294 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

| n258 - Folder Closed | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (mm) | (dB) | (mW/cm²) | (mW/cm²) | |
| 25 200 | 2032499 | K Patch | 15 | - | 2.2 | SISO | Front | 2 | 0.06 | 0.117 | 0.250 | - |
| 25 200 | 2032499 | | 16 | - | 2.0 | SISO | Left | 2 | 0.13 | **0.319** | **0.465** | 4 |
| 25 200 | 2032499 | | - | 276 | 4.1 | SISO | Front | 2 | -0.09 | 0.278 | 0.339 | - |
| 24 800.04 | 2025833 | | - | 276 | 4.1 | SISO | Left | 2 | -0.09 | 0.302 | 0.438 | - |
| 25 200 | 2032499 | | 20 | 276 | -1.0 | MIMO | Front | 2 | -0.18 | 0.0804 | 0.109 | - |
| 25 200 | 2032499 | | 20 | 276 | -1.0 | MIMO | Left | 2 | -0.11 | 0.291 | 0.384 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

| n261 - Folder Open | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (mm) | (dB) | (mW/cm²) | (mW/cm²) | |
| 27 550.08 | 2071667 | K Patch | 15 | - | 1.4 | SISO | Front | 2 | 0.12 | 0.317 | 0.457 | - |
| 27 550.08 | 2071667 | | 15 | - | 1.4 | SISO | Left | 2 | 0.14 | 0.347 | 0.499 | - |
| 27 550.08 | 2071667 | | - | 269 | 3.6 | SISO | Front | 2 | 0.13 | 0.181 | 0.228 | - |
| 28 299.96 | 2084165 | | - | 276 | 3.3 | SISO | Left | 2 | 0.12 | **0.290** | **0.575** | 2 |
| 27 550.08 | 2071667 | | 17 | 273 | -1.1 | MIMO | Front | 2 | -0.13 | 0.107 | 0.156 | - |
| 27 550.08 | 2071667 | | 17 | 273 | -1.1 | MIMO | Left | 2 | 0.15 | 0.318 | 0.462 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

| n261 - Folder Closed | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (mm) | (dB) | (mW/cm²) | (mW/cm²) | |
| 27 550.08 | 2071667 | K Patch | 15 | - | 1.4 | SISO | Left | 2 | -0.12 | 0.354 | 0.514 | - |
| 28 299.96 | 2084165 | | - | 272 | 3.1 | SISO | Left | 2 | 0.06 | **0.278** | **0.516** | 5 |
| 28 299.96 | 2084165 | | 16 | 272 | -1.3 | MIMO | Left | 2 | 0.07 | 0.228 | 0.417 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

| n260 - Folder Open | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (mm) | (dB) | (mW/㎠) | (mW/㎠) | |
| 37 050 | 2229999 | K Patch | 20 | - | 2.4 | SISO | Rear | 2 | -0.10 | 0.280 | 0.324 | - |
| 37 050 | 2229999 | | 20 | - | 2.4 | SISO | Left | 2 | -0.05 | 0.467 | 0.641 | - |
| 39 949.92 | 2278331 | | - | 270 | 3.2 | SISO | Rear | 2 | -0.11 | 0.199 | 0.335 | - |
| 37 050 | 2229999 | | - | 272 | 2.5 | SISO | Left | 2 | -0.18 | **0.470** | **0.692** | 3 |
| 37 050 | 2229999 | | 20 | 276 | -1.0 | MIMO | Rear | 2 | -0.01 | 0.269 | 0.343 | - |
| 37 050 | 2229999 | | 16 | 272 | -1.2 | MIMO | Left | 2 | -0.03 | 0.435 | 0.622 | - |
| 37 050 | 2229999 | | - | 272 | 2.5 | SISO | Left | 10 | -0.14 | 0.369 | 0.431 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

| n260 - Folder Closed | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (mm) | (dB) | (mW/㎠) | (mW/㎠) | |
| 38 499.96 | 2254165 | K Patch | 20 | - | 2.4 | SISO | Left | 2 | -0.13 | 0.444 | 0.606 | - |
| 39 949.92 | 2278331 | | - | 271 | 2.9 | SISO | Left | 2 | -0.02 | 0.442 | 0.621 | - |
| 37 050 | 2229999 | | 16 | 272 | -1.2 | MIMO | Left | 2 | 0.02 | **0.402** | **0.622** | 6 |
| 37 050 | 2229999 | | 16 | 272 | -1.2 | MIMO | Left | 5 | 0.12 | 0.389 | 0.563 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

## 7.2 Power Density Results -Non-Selected Surface validation

| n258 Non-Selected Surface validation- Folder Open | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (㎜) | (dB) | (㎽/㎠) | (㎽/㎠) | |
| 24800.04 | 2025833 | K Patch | - | 268 | 9.6 | SISO | Top | 2 | -0.15 | 0.0323 | 0.0402 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

| n258 Non-Selected Surface validation - Folder Close | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (㎜) | (dB) | (㎽/㎠) | (㎽/㎠) | |
| 24800.04 | 2025833 | K Patch | 15 | - | 2.2 | SISO | Rear | 2 | -0.18 | 0.125 | 0.170 | - |
| 24800.04 | 2025833 | | - | 273 | 7.3 | SISO | Top | 2 | -0.08 | 0.0620 | 0.0685 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

| n261 Non-Selected Surface validation - Folder Open | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (㎜) | (dB) | (㎽/㎠) | (㎽/㎠) | |
| 27924.96 | 2077915 | K Patch | - | 275 | 3.6 | SISO | Rear | 2 | 0.10 | 0.345 | 0.407 | - |
| 27924.96 | 2077915 | | 16 | - | 2.2 | SISO | Top | 2 | -0.10 | 0.0472 | 0.0505 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

| n261 Non-Selected Surface validation - Folder Close | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (㎜) | (dB) | (㎽/㎠) | (㎽/㎠) | |
| 27924.96 | 2077915 | K Patch | 17 | - | 2 | SISO | Rear | 2 | -0.02 | 0.122 | 0.185 | - |
| 27924.96 | 2077915 | | - | 274 | 3.7 | SISO | Front | 2 | -0.02 | 0.314 | 0.335 | - |
| 27924.96 | 2077915 | | 12 | - | 2.2 | SISO | Top | 2 | 0.19 | 0.0762 | 0.0773 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

| n260 Non-Selected Surface validation - Folder Open | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (㎜) | (dB) | (㎽/㎠) | (㎽/㎠) | |
| 38499.96 | 2254165 | K Patch | 14 | - | 3.2 | SISO | Front | 2 | 0.13 | 0.411 | 0.423 | - |
| 38499.96 | 2254165 | | - | 268 | 2.6 | SISO | Top | 2 | -0.17 | 0.0403 | 0.0410 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

| n260 Non-Selected Surface validation - Folder Close | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Ant. | Beam ID1 | Beam ID2 | Input.power | Ant | Test Position | Distance | Power Drift | Normal psPD | Total psPD | Plot No. |
| MHz | Ch. | | V | H | (dBm) | | | (㎜) | (dB) | (㎽/㎠) | (㎽/㎠) | |
| 38499.96 | 2254165 | K Patch | 14 | - | 3.2 | SISO | Rear | 2 | 0.03 | 0.194 | 0.198 | - |
| 38499.96 | 2254165 | | - | 263 | 6.7 | SISO | Front | 2 | -0.14 | 0.236 | 0.445 | - |
| 38499.96 | 2254165 | | 12 | - | 3.5 | SISO | Top | 2 | -0.13 | 0.0419 | 0.0527 | - |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/ General Population | | | | | | | Power Density<br>1 mW/cm²<br>Averaged over 4 cm² | | | | | |

## 7.2 Power density Test Notes

**General Notes:**

1. The manufacturer has confirmed that the devices tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
2. Batteries are fully charged at the beginning of the measurements. The DUT was connected to a wall charger for some measurements due to the test duration. It was confirmed that the charger plugged into this DUT did not impact the near-field PD test results.
3. Power density was calculated by repeated E-field measurements on two measurement planes separated by λ/4.
4. DUT was configured to transmit with a manufacturer provided test software to control specific antenna(s), Beam ID(s), and signal type to ensure the test configurations constant for the entire evaluation.
5. Input.power.limit parameter for 5G mmW NR radio was calculated in Part 0 PD report.
6. Per FCC TCBC Workshop Notes Apr. 2020, when the device is using the Qualcomm-based method already approved by FCC there is no need to submit a pre-submission (pre-TCB) KDB to have the test plan approved.
7. PD_design_target of 0.631 ㎽/㎠ was used with mmW device design related uncertainty of 2 dB.
8. Input.power.limit parameter for 5G mmW NR radio was calculated in Part 0 Power Density Report.
9. This device is enabled with Qualcomm® Smart Transmit feature to control and manage transmitting power in real time and to ensure that the time-averaged RF exposure from WWAN and WLAN is in compliance with FCC requirements. Per FCC guidance for devices enabled with Qualcomm® Smart Transmit feature, 4G LTE/5G NR FR1, WLAN/BT, and 5G mmW NR FR2 simultaneous transmission scenario does not need to be evaluated under Total Exposure Ratio (TER). The validation of the time-averaging algorithm and compliance under the Tx varying transmission scenario for WWAN and WLAN technologies are reported in Part 2 report.
10. Per FCC guidance for devices enable with Qualcomm® Smart Transmit feature, simultaneous transmission analysis is evaluated by combining the exposure from External Radio NFC antenna. 5G mmW NR and NFC antenna. simultaneous transmission scenario is evaluated under the Total Exposure Ratio (TER) in Section 8.
11. The Beam ID with one of the highest initial simulated power density for that surface and distance was selected for Part 1 Power Density measurements.
12. The device was configured to transmit CW wave signal for testing. Per FCC guidance for devices enabled with Qualcomm® Smart Transmit feature, additional testing was not required for different modulations(CP-OFDM QPSK, CP-OFDM 16QAM, CP-OFDM 64QAM, DFT-s-ODFM Pi/2BPSK, DFT-s ODFM QPSK, DFT-s-OFDM 16QAM, DFT-s-ODFM 64QAM), RB configurations, component carriers, channel configurations(low channel, mid channel, high channel) since the smart transmit algorithm monitors powers on a per symbol basis, which is independent of these signal characteristics.
13. The device was configured to MIMO configuration with H and V polarization beams transmitting together..
14. In some cases, the simulation vs. measurement for some surfaces can exceed the device's total uncertainty. Therefore, some additional tests were performed to support simultaneous transmission analysis. See Section8.

# 8. The Total Exposure Ratio

The Total Exposure Ratio (TER) is calculated by combining all SAR measurements and power density measurement after normalizing to their respective limits. The general expression is below.

$$TER = \sum_{a=1}^{A} \frac{SAR_a}{SAR_a, limit} + \sum_{b=1}^{B} \frac{psPD_b}{psPD_b, limit} < 1$$

The TER shall be less than unity to ensure compliance with the limits.

$$\sum_{n=1}^{N} \frac{4G\ SAR_n}{4G\ SAR_n, limit} + \sum_{m=1}^{M} \frac{5G\ mmW\ NR\ psPD_m}{5G\ mmW\ NR\ psPD_m, limit} + \sum_{p=1}^{P} \frac{WLAN\ SAR_p}{WLAN\ SAR_p, limit}$$

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 device uncertainty. For this device, the manufacturer has added an additional permanent back-off (indicated below as WWAN backoff) for every beam in the calculations for input.power.limits used in the EFS file. The back-off levels can be found in the Part 0 PD Test report. Therefore, 5G mmW NR RF exposure for this DUT is evaluated by reported psPD calculated as:

reported_psPD= (PD_design_target+PD_uncertainty) x 10(-WWAN backoff in dB)/10)

Note that since not all the beams supported by this EUT are measured, reported_psPD cannot be computed based on limited measured psPD data. Alternatively, since measured psPD for all the beams will be ≤PD_design_target + PD_uncertainty uncertainty, reported_psPD is computed based on this worst-case psPD as shown above.

Note that the above reported psPD applies to the worst-case surfaces of the DUT at 2mm evaluation distance. Worst-case PD on other surfaces of the DUT are calculated from simulated PD data (see Power Density Simulation Report), by multiplying reported psPD with the highest proportion out of all beams and out of all three channels in each band, where the adjustment for each beam/channel is computed as the proportion of "simulated PD on desired surface" to "simulated PD on worst-surface". For example, to determine worst-case PD on front surface (needed for Head RF Exposure evaluation during simultaneous transmission), highest proportion of (simulated PD on front surface)/(simulated PD on worst surface) was determined out of all supported beams and out of all three channels by the DUT in each band

In some cases, the simulation vs measurement for some surfaces can exceed the device's total uncertainty. In those cases, if the measured psPD > simulated adjusted psPD (assuming a linear congruency of the psPD across surfaces), then measured psPD should be used towards the simultaneous TX analysis. Table 8-1 lists the relevant worst-case reported psPD values based on the additional surfaces and evaluation distances needed to perform the TER analysis.

The highest of the adjusted Reported_psPD and Measured Total psPD was chosen for TER analysis and the chosen values are indicated by bolded psPD values.

Table 8-1

| The worst-case reported psPD values – 2mm | | | | | | | |
|---|---|---|---|---|---|---|---|
| Antenna Module | Folder Open | Configuration | Evaluation Distance | Adjustment Factor due to Simulation | Adjusted Reported psPD (mW/cm2) | Measured Total psPD (mW/cm2) | Final Reported psPD (mW/cm2) |
| K | Open | Rear | 2 mm | 0.693 | 0.677 | 0.356 | 0.677 |
| | | Front | 2 mm | 0.785 | 0.767 | 0.499 | 0.767 |
| | | Left | 2 mm | 1.000 | 0.977 | 0.692 | **0.977** |
| | | Right | 2 mm | 0.043 | 0.042 | - | 0.042 |
| | | Top | 2 mm | 0.092 | 0.090 | 0.0505 | 0.090 |
| | | Bottom | 2 mm | 0.030 | 0.029 | - | 0.029 |
| | Close | Rear | 2 mm | 0.407 | 0.398 | 0.198 | 0.398 |
| | | Front | 2 mm | 0.710 | 0.694 | 0.339 | 0.694 |
| | | Left | 2 mm | 1.000 | 0.977 | 0.622 | **0.977** |
| | | Right | 2 mm | 0.061 | 0.060 | - | 0.060 |
| | | Top | 2 mm | 0.261 | 0.255 | 0.0773 | 0.255 |
| | | Bottom | 2 mm | 0.108 | 0.106 | - | 0.106 |

Note: Adjusted f actor is (simulated PD on desired exposure plane)/(PD o n worst-surf ace at 2mm evaluation distance) out of all beams and out of all channels. See Power Density Simulation Report

## 8.1 Total Exposure Ratio for each exposure condition

**Table 8-2**

**5G mmWave NR Phablet Total Exposure Ratio**

| | NR FR2 | Worst case NFC Reported SAR | NR FR2+NFC |
|---|---|---|---|
| | W/cm² | W/kg | |
| Applicable Limit | 1 | 4.0 | 1.0 |
| Reported Value | 0.977 | 0.00743 | |
| Ratio to limit | 0.977 | 0.002 | **0.979** |

**Note:**

1. Worst case Power density results for each test configuration among all antenna arrays and among all supported bands were considered for TER Analysis.
2. For Power density measurements, a test separation distance of 2mm was used for phablet configuration due to mmWave probe restraints.
3. The worst-case between Adjusted Reported_psPD and Measured Total psPD was chosen for TER analysis.
4. The worst-case between Adjusted_Reported_psPD and measured Total psPD was chosen for TER analysis.

The above numerical summed PD and SAR for all the worst case simultaneous transmission conditions were Total Exposure Ratio.
Therefore, the above analysis is sufficient to determine no further test cases are required and that simultaneous transmission is compliant to the FCC RF exposure limit.

# 9. Measurement Uncertainty

| Measurement Uncertainty for CDASY6 mmWave module | | | | | | |
|---|---|---|---|---|---|---|
| *a* | *b* | *c* | *d* | *e* | *f = b x e / d* | *g* |
| **Source of uncertainty** | **Uncertainty Value (± dB)** | **Probability distribution** | **Div.** | **ci** | **Standard Uncertainty (± dB)** | **vi** |
| Probe calibration | 0.49 | N | 1 | 1 | 0.49 | ∞ |
| Probe correction | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Frequency Response(BW≤ 1GHz) | 0.20 | R | 1.73 | 1 | 0.12 | ∞ |
| Sensor cross coupling | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Istropy | 0.50 | R | 1.73 | 1 | 0.29 | ∞ |
| Linearity | 0.20 | R | 1.73 | 1 | 0.12 | ∞ |
| Probe scattering | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Probe positioning offset | 0.30 | R | 1.73 | 1 | 0.17 | ∞ |
| Probe positioning Repeatability | 0.04 | R | 1.73 | 1 | 0.02 | ∞ |
| Probe spatial Resolution | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Field Impedence Dependence | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Sensor Mechanical Offset | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Amplitude and Phase noise | 0.04 | R | 1.73 | 1 | 0.02 | ∞ |
| Measurement area truncation | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Data acquisition | 0.03 | N | 1 | 1 | 0.03 | ∞ |
| Field Reconstruction | 0.60 | R | 1.73 | 1 | 0.35 | ∞ |
| Forward Transformation | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Power density Scailing | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Spatial Averaging | 0.10 | R | 1.73 | 1 | 0.06 | ∞ |
| **Test sample and Environmental Factors** | | | | | | |
| Probe coupling with DUT | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Modulation Response | 0.40 | R | 1.73 | 1 | 0.23 | ∞ |
| Integration time | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Response time | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Device holder influence | 0.10 | R | 1.73 | 1 | 0.06 | ∞ |
| DUT alignment | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| RF Ambient Conditions | 0.04 | R | 1.73 | 1 | 0.02 | ∞ |
| RF ambient - reflections | 0.04 | R | 1.73 | 1 | 0.02 | ∞ |
| Immunity/Secondary Reception | 0.00 | R | 1.73 | 1 | 0.00 | ∞ |
| Power Drif of DUT | 0.21 | R | 1.73 | 1 | 0.12 | ∞ |
| Combined standard uncertainty (k = 1) | | RSS | | | 0.76 | ∞ |
| **Expanded uncertainty (95% confidence level)** | | *k = 2* | | | **1.52** | |

## 10 Power Density Test Equipment

| Manufacturer | Type / Model | S/N | Calib. Date | Calib.Interval | Calib.Due |
|---|---|---|---|---|---|
| SPEAG | 5G Module Phantom | - | N/A | N/A | N/A |
| HP | SAR System Control PC | - | N/A | N/A | N/A |
| Staubli | CS8Cspeag-TX90 | F17/ 59CHA1/ C/ 01 | N/A | N/A | N/A |
| Staubli | TX90 XLspeag | F17/ 59RAA1/ A/ 01 | N/A | N/A | N/A |
| Staubli | Teach Pendant (Joystick) | 010963 | N/A | N/A | N/A |
| SPEAG | DAE4 | 1687 | 07/18/2023 | Annual | 07/18/2024 |
| SPEAG | E-Field Probe EUmmWV4 | 9486 | 06/19/2023 | Annual | 06/19/2024 |
| SPEAG | Dipole 5G Verification Source 30 GHz | 1011 | 07/13/2023 | Annual | 07/13/2024 |
| TESTO | 175-H1/Thermometer | 40331915309 | 12/26/2023 | Annual | 12/26/2024 |

# 11. Conclusion

The Power density measurements and total exposure ratio analysis indicate that the DUT complies with the RF radiation exposure limits of the FCC, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the RF Exposure and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

# 12. References

[1] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300Ghz, New York: IEEE, Sep. 1992.

[2] IEC TR 63170:2018, Measurement Procedure for the Evaluation of Power Density Related to Human Exposure to Radiofrequency Fields from Wireless Communication Devices Operating between 6GHz and 100GHz.

[3] IEC TR 62630:2010, Guidance for Evaluating Exposure from Multiple Electromagnetic Sources.

[4] K. Pokovic, T. Schmid, J. Frohlich, and N. Kuster. Novel Probes and Evaluation Procedures to Assess Field Magnitude and Polarization. IEEE Transactions on Electromagnetic Compatibility 42(2): 240 – 244, 2000.

[5] R. W. Gerchberg and W. O. Saxton. A Practical Algorithm for the Determination of Phase from Image and Diffraction Plane Pictures. Optik 35(2): 237 – 346, 1972.

[6] A. P. Anderson and S. Sali. New Possibilities for Phaseless Microwave Diagnostics. Part 1: Error Reduction Techniques. IEE Proceedings H – Microwaves, Antennas and Propagation 132(5): 290 – 298, 1985.

[7] FCC KDB 865664 D02 v01r04: SAR Measurement Requirements for 100 MHz to 6GHz. Federal Communications Commission – Office of Engineering and Technology, Laboratory Division.

[8] FCC KDB 447498 D01 v06: RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices. Federal Communications Commission – Office of Engineering and Technology, Laboratory Division.

[9] November 2017 Telecommunications Certification Body Council (TCBC) Workshop Notes

[10] October 2018 Telecommunications Certification Body Council (TCBC) Workshop Notes

[11] April 2019 Telecommunications Certification Body Council (TCBC) Workshop Notes

[12] November 2019 Telecommunications Certification Body (TCBC) Workshop Notes

[13] SPEAG DASY6 System Handbook (September 2019)

# Appendix A. – DUT Ant. Information & SETUP PHOTO

**Please refer to test DUT Ant. Information &setup photo file no. as follows:**

| Report No. |
| --- |
| HCT-SR-2404-FC005-P |

# Appendix B. – Power Density Test Plots

Test Laboratory: HCT CO., LTD
EUT Type: Mobile Phone
Ambient Temperature: 19.0 ℃
Test Date: 04/12/2024
Plot No.: 1

**Measurement Report for Device, EDGE LEFT, Custom Band, CW, Channel 25200000 (25200.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | EDGE LEFT, 2.00 | NR n258 | CW, 0-- | 25200.0, 25200000 | 1.0 |

**Hardware Setup**

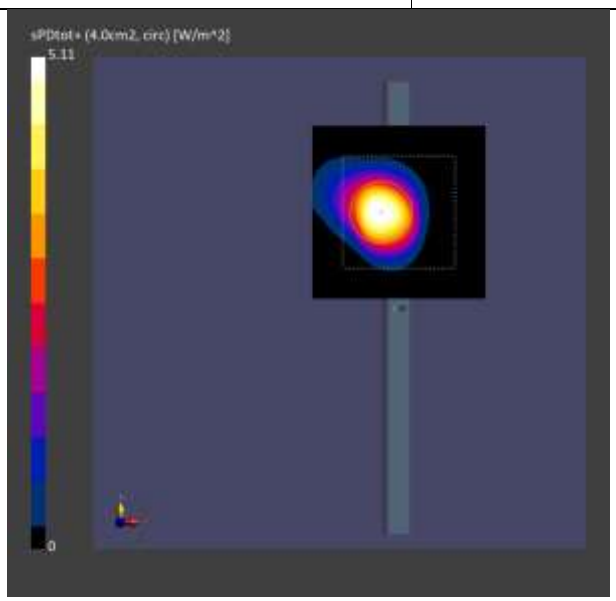
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.17158298424721127 x 0.17158298424721127 |
| Sensor Surface [mm] | 2.0 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 3.28 |
| psPDtot+ [$W/m^2$] | 5.11 |
| $E_{max}$ [V/m] | 91.2 |
| Power Drift [dB] | -0.01 |



Test Laboratory: HCT CO., LTD
EUT Type: Mobile Phone
Ambient Temperature: 19.4 ℃
Test Date: 04/16/2024
Plot No.: 2

**Measurement Report for Device, EDGE LEFT, Custom Band, CW, Channel 28300000 (28300.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | EDGE LEFT, 2.00 | NR n261 | CW, 0-- | 28300.0, 28300000 | 1.0 |

**Hardware Setup**

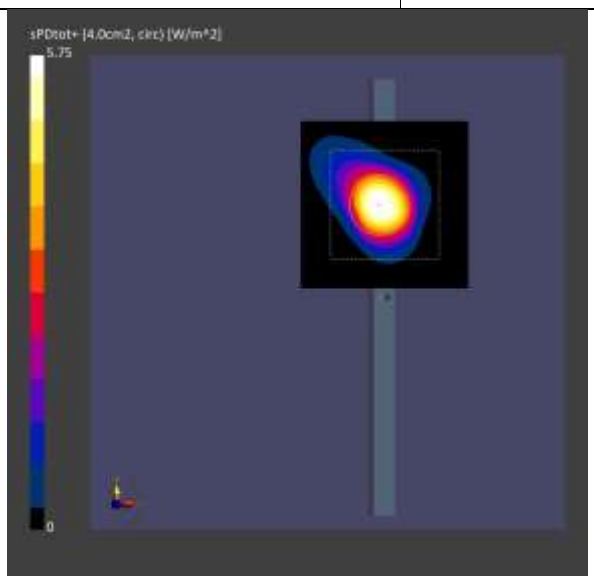
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.19269041484905072 x 0.19269041484905072 |
| Sensor Surface [mm] | 2.0 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 2.90 |
| psPDtot+ [$W/m^2$] | 5.75 |
| $E_{max}$ [V/m] | 102 |
| Power Drift [dB] | 0.12 |



Test Laboratory: HCT CO., LTD
EUT Type: Mobile Phone
Ambient Temperature: 19.7 ℃
Test Date: 04/15/2024
Plot No.: 3

**Measurement Report for Device, EDGE LEFT, Custom Band, CW, Channel 37050000 (37050.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | EDGE LEFT, 2.00 | NR n260 | CW, 0-- | 37050.0, 37050000 | 1.0 |

**Hardware Setup**

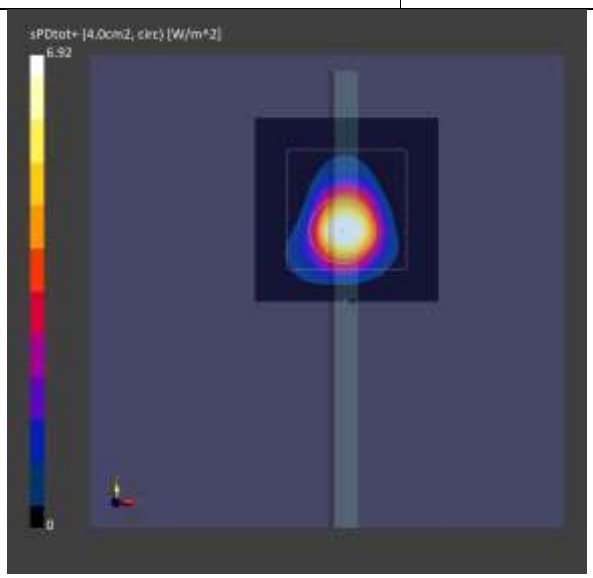
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 2.0 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 4.70 |
| psPDtot+ [$W/m^2$] | 6.92 |
| $E_{max}$ [V/m] | 131 |
| Power Drift [dB] | -0.18 |



Test Laboratory: HCT CO., LTD
EUT Type: Mobile Phone
Ambient Temperature: 20.7 ℃
Test Date: 04/17/2024
Plot No.: 4

**Measurement Report for Device, EDGE LEFT, Custom Band, CW, Channel 25200000 (25200.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | EDGE LEFT, 2.00 | NR n258 | CW, 0-- | 25200.0, 25200000 | 1.0 |

**Hardware Setup**

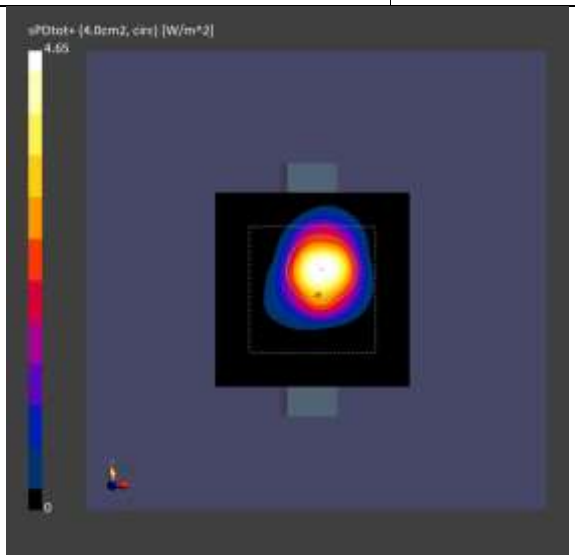
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.17158298424721127 x 0.17158298424721127 |
| Sensor Surface [mm] | 2.0 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 3.19 |
| psPDtot+ [$W/m^2$] | 4.65 |
| $E_{max}$ [V/m] | 92.3 |
| Power Drift [dB] | 0.13 |



Test Laboratory: HCT CO., LTD
EUT Type: Mobile Phone
Ambient Temperature: 19.3 ℃
Test Date: 04/19/2024
Plot No.: 5

**Measurement Report for Device, EDGE LEFT, Custom Band, CW, Channel 28300000 (28300.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | EDGE LEFT, 2.00 | NR n261 | CW, 0-- | 28300.0, 28300000 | 1.0 |

**Hardware Setup**

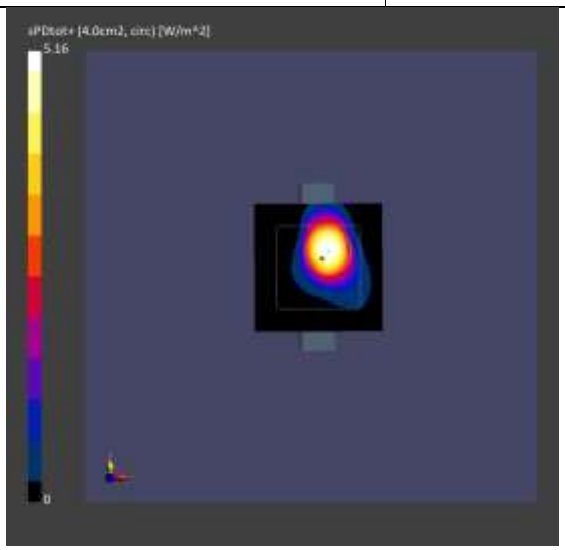
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.19269041484905072 x 0.19269041484905072 |
| Sensor Surface [mm] | 2.0 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 2.78 |
| psPDtot+ [$W/m^2$] | 5.16 |
| $E_{max}$ [V/m] | 108 |
| Power Drift [dB] | 0.06 |



Test Laboratory: HCT CO., LTD
EUT Type: Mobile Phone
Ambient Temperature: 20.2 ℃
Test Date: 04/18/2024
Plot No.: 6

**Measurement Report for Device, EDGE LEFT, Custom Band, CW, Channel 37050000 (37050.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | EDGE LEFT, 2.00 | NR n260 | CW, 0-- | 37050.0, 37050000 | 1.0 |

**Hardware Setup**

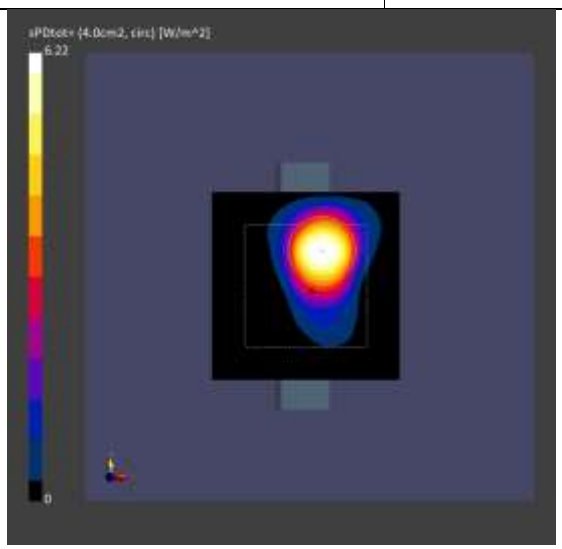
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 2.0 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 4.02 |
| psPDtot+ [$W/m^2$] | 6.22 |
| $E_{max}$ [V/m] | 102 |
| Power Drift [dB] | 0.02 |



# Appendix C. – System Check Plots

## ■ Verification Data (30 GHz)

Test Laboratory: HCT CO., LTD
Ambient Temp.: 19.0 ℃
Test Date: 04/12/2024

**Measurement Report for Device, FRONT, Validation band, CW, Channel 30000 (30000.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | FRONT, 5.55 | Validation band | CW, 0-- | 30000.0, 30000 | 1.0 |

**Hardware Setup**

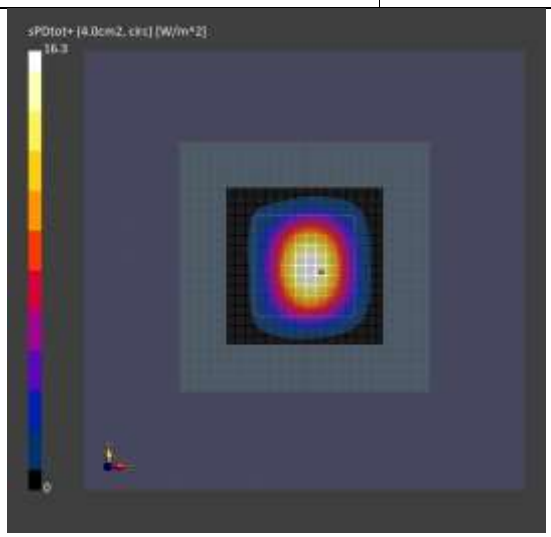
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 5.55 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 16.0 |
| psPDtot+ [$W/m^2$] | 16.3 |
| $E_{max}$ [V/m] | 93.9 |
| Power Drift [dB] | 0.06 |



## ■ Verification Data (30 GHz)

Test Laboratory: HCT CO., LTD
Ambient Temp.: 19.7 ℃
Test Date: 04/15/2024

**Measurement Report for Device, FRONT, Validation band, CW, Channel 30000 (30000.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | FRONT, 5.55 | Validation band | CW, 0-- | 30000.0, 30000 | 1.0 |

**Hardware Setup**

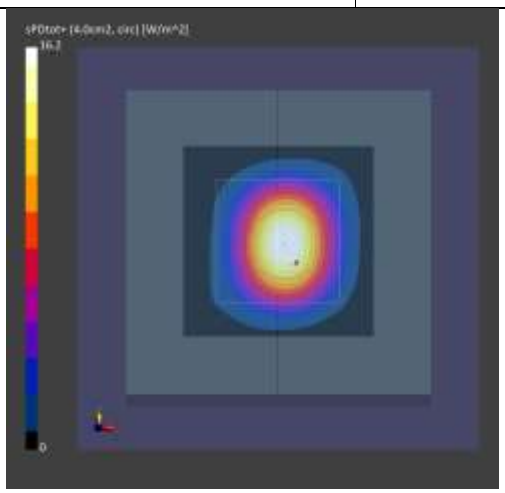
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 5.55 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 15.9 |
| psPDtot+ [$W/m^2$] | 16.2 |
| $E_{max}$ [V/m] | 93.9 |
| Power Drift [dB] | 0.12 |



## ■ Verification Data (30 GHz)

Test Laboratory: HCT CO., LTD
Ambient Temp.: 19.4 ℃
Test Date: 04/16/2024

**Measurement Report for Device, FRONT, Validation band, CW, Channel 30000 (30000.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | FRONT, 5.55 | Validation band | CW, 0-- | 30000.0, 30000 | 1.0 |

**Hardware Setup**

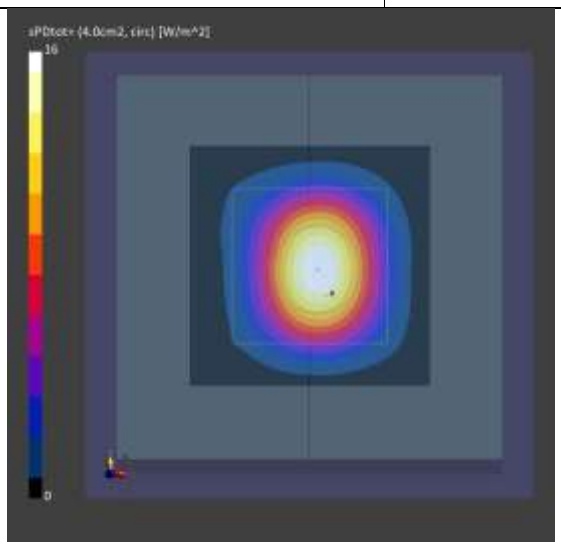
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 5.55 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 15.8 |
| psPDtot+ [$W/m^2$] | 16.0 |
| $E_{max}$ [V/m] | 93.4 |
| Power Drift [dB] | 0.03 |



## ■ Verification Data (30 GHz)

Test Laboratory: HCT CO., LTD
Ambient Temp.: 20.7 ℃
Test Date: 04/17/2024

**Measurement Report for Device, FRONT, Validation band, CW, Channel 30000 (30000.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | FRONT, 5.55 | Validation band | CW, 0-- | 30000.0, 30000 | 1.0 |

**Hardware Setup**

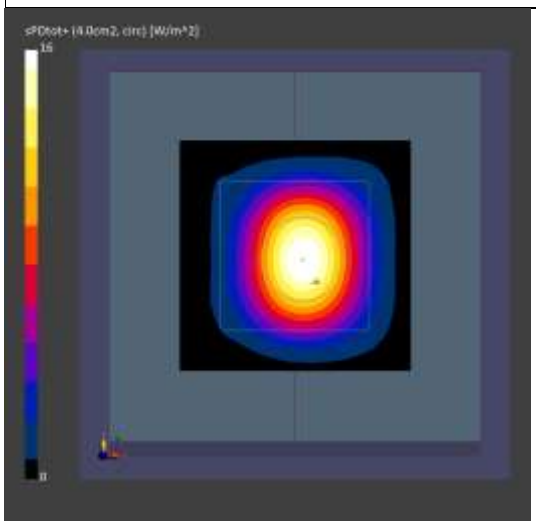
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 5.55 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 15.7 |
| psPDtot+ [$W/m^2$] | 16.0 |
| $E_{max}$ [V/m] | 93.5 |
| Power Drift [dB] | 0.08 |



## ■ Verification Data (30 GHz)

Test Laboratory: HCT CO., LTD
Ambient Temp.: 20.2 ℃
Test Date: 04/18/2024

**Measurement Report for Device, FRONT, Validation band, CW, Channel 30000 (30000.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | FRONT, 5.55 | Validation band | CW, 0-- | 30000.0, 30000 | 1.0 |

**Hardware Setup**

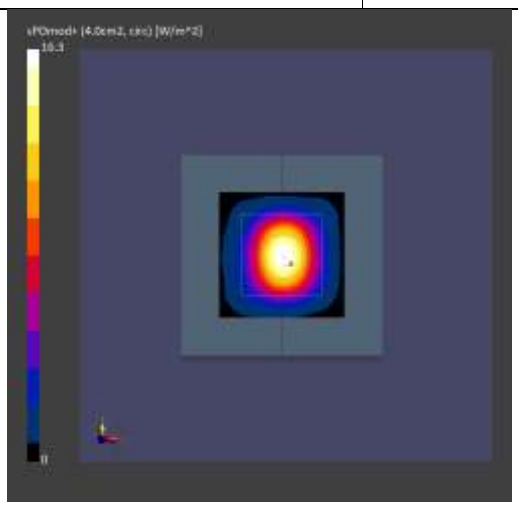
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 5.55 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 14.7 |
| psPDtot+ [$W/m^2$] | 15.0 |
| $E_{max}$ [V/m] | 94.0 |
| Power Drift [dB] | 0.02 |



## ■ Verification Data (30 GHz)

Test Laboratory: HCT CO., LTD
Ambient Temp.: 19.3 ℃
Test Date: 04/19/2024

**Measurement Report for Device, FRONT, Validation band, CW, Channel 30000 (30000.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | FRONT, 5.55 | Validation band | CW, 0-- | 30000.0, 30000 | 1.0 |

**Hardware Setup**

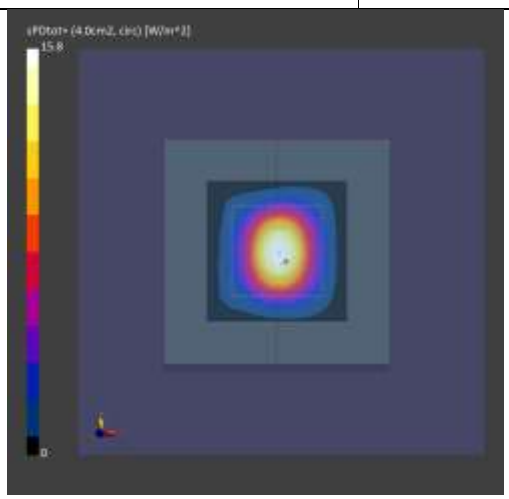
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 5.55 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 15.6 |
| psPDtot+ [$W/m^2$] | 15.9 |
| $E_{max}$ [V/m] | 94.3 |
| Power Drift [dB] | 0.06 |



## ■ Verification Data (30 GHz)

Test Laboratory: HCT CO., LTD
Ambient Temp.: 20.5 ℃
Test Date: 04/20/2024

**Measurement Report for Device, FRONT, Validation band, CW, Channel 30000 (30000.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | FRONT, 5.55 | Validation band | CW, 0-- | 30000.0, 30000 | 1.0 |

**Hardware Setup**

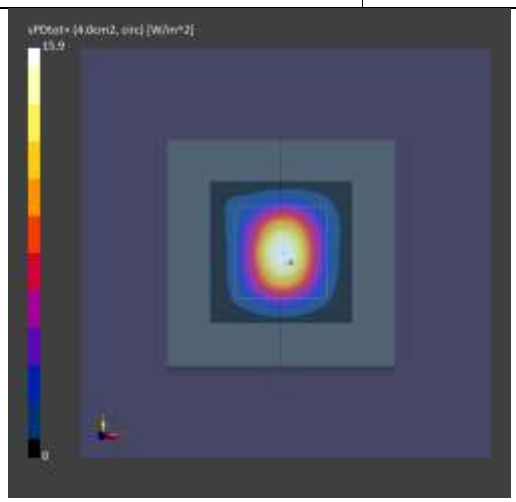
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 5.55 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 15.7 |
| psPDtot+ [$W/m^2$] | 15.9 |
| $E_{max}$ [V/m] | 94.2 |
| Power Drift [dB] | 0.00 |



## ■ Verification Data (30 GHz)

Test Laboratory: HCT CO., LTD
Ambient Temp.: 19.7 ℃
Test Date: 04/22/2024

**Measurement Report for Device, FRONT, Validation band, CW, Channel 30000 (30000.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | FRONT, 5.55 | Validation band | CW, 0-- | 30000.0, 30000 | 1.0 |

**Hardware Setup**

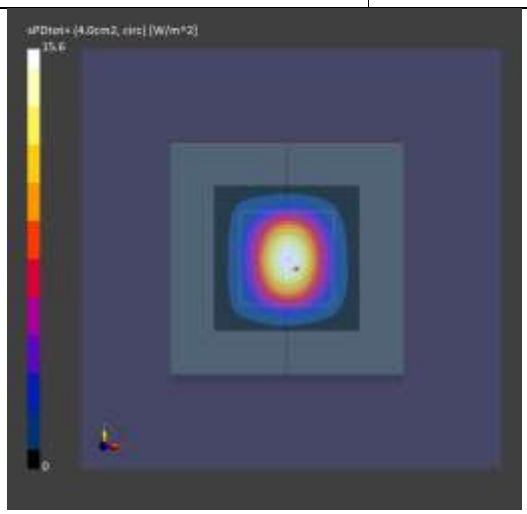
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 5.55 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 15.4 |
| psPDtot+ [$W/m^2$] | 15.6 |
| $E_{max}$ [V/m] | 93.6 |
| Power Drift [dB] | 0.02 |



■ **Verification Data (30 GHz)**

Test Laboratory: HCT CO., LTD
Ambient Temp.: 19.9 ℃
Test Date: 04/23/2024

**Measurement Report for Device, FRONT, Validation band, CW, Channel 30000 (30000.0 MHz)**

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G | FRONT, 5.55 | Validation band | CW, 0-- | 30000.0, 30000 | 1.0 |

**Hardware Setup**

| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave | Air - | EUmmWV4 - SN9486_F1-55GHz, 2023-06-19 | DAE4 Sn1687, 2023-07-18 |

**Scans Setup**

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 5.55 |

**Measurement Results**

| | |
|---|---|
| Scan Type | 5G Scan |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 15.4 |
| psPDtot+ [$W/m^2$] | 15.7 |
| $E_{max}$ [V/m] | 93.6 |
| Power Drift [dB] | 0.04 |