



## **PART 1 Test Under Static Transmission Scenario**

### **Test Report No.: 14131461H-H-R1**

|                     |                                                                                              |
|---------------------|----------------------------------------------------------------------------------------------|
| Customer            | Panasonic Corporation of North America                                                       |
| Description of EUT  | Personal Computer                                                                            |
| Model Number of EUT | FZ-40                                                                                        |
| FCC ID              | ACJ9TGFZ40                                                                                   |
| Test Regulation     | FCC47CFR 2.1093                                                                              |
| Test Result         | Complied (Refer to SECTION 7)                                                                |
| PD Value            | The highest PD<br>Reported PD = 7.30 W/m <sup>2</sup><br>Measured PD = 7.17 W/m <sup>2</sup> |
| Issue Date          | July 6, 2022                                                                                 |
| Remarks             | -                                                                                            |

Representative test engineer

Hisayoshi Sato  
Engineer

Approved by

Takayuki Shimada  
Leader



CERTIFICATE 5107.02

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**UL Japan, Inc. Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan / +81-596-24-8999

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## 1 Introduction

This device uses Qualcomm® Smart Transmit feature. These modem(s) is enabled in Qualcomm® Smart Transmit Feature to control and manage transmitting power in real time and to ensure at all times the averaged RF exposure is in compliance with FCC/ISED requirements.

This report (part 1) demonstrates that Qualcomm® Reference Design (QRD) complies with FCC/ISED RF exposure limits at these maximum time averaged power limits.

Note: WLAN operations are not enabled with Smart Transmit.

## 2 Customer information

|                  |                                                                     |
|------------------|---------------------------------------------------------------------|
| Company Name     | Panasonic Corporation of North America                              |
| Address          | Two Riverfront Plaza, 9th Floor Newark, NEW JERSEY, 07102-5940, USA |
| Telephone Number | +1-201-348-7760                                                     |
| Contact Person   | Ben Botros                                                          |

The information provided from the customer is as follows;

- Customer, Description of EUT, Model No. FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 2: Customer information
- SECTION 3: Equipment under test (EUT) other than the Receipt Date
- SECTION 8: Tune-up tolerance information, input power limit and software information

\* The laboratory is exempted from liability of any test results affected from the above information in section 3.

## 3 Equipment under test (EUT)

### 3.1 Identification of EUT

|               |                                                                                            |
|---------------|--------------------------------------------------------------------------------------------|
| Description   | Personal Computer                                                                          |
| Model Number  | FZ-40                                                                                      |
| Serial number | 1LTSA00160                                                                                 |
| Rating        | AC 100 V to 240 V, 50 Hz / 60 Hz                                                           |
| Condition     | Engineering prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification  | No Modification by the test lab.                                                           |
| Receipt Date  | February 4, 2022                                                                           |
| Test Date     | March 8 to 16, 2022                                                                        |

### 3.2 Product description

Model: FZ-40 (referred to as the EUT in this report) is a Personal Computer.

|                                       |                                   |         |      |                                                   |
|---------------------------------------|-----------------------------------|---------|------|---------------------------------------------------|
| 5G NR (FR2)                           | TDD                               | 120 kHz | n258 | Pi/2 BPSK (DFT-s-OFDM), QPSK (CP-OFDM/DFT-s-OFDM) |
|                                       | TDD                               | 120 kHz | n260 | 16QAM (CP-OFDM/DFT-s-OFDM),                       |
|                                       | TDD                               | 120 kHz | n261 | 64QAM (CP-OFDM/DFT-s-OFDM)                        |
|                                       | -                                 | -       | -    |                                                   |
|                                       | -                                 | -       | -    | MIMO Support: No                                  |
| EN-DC(LTE-FR2 mmW)<br>(NSA mode only) | Supported combination             |         |      | *B48: not used in Canada(ISED)                    |
|                                       | LTE Anchor Bands for NR band n258 |         |      | LTE Band 2/5/7/12/66                              |
|                                       | LTE Anchor Bands for NR band n260 |         |      | LTE Band 2/5/12/13/14/48*/66                      |
|                                       | LTE Anchor Bands for NR band n261 |         |      | LTE Band 2/5/13/48*/66                            |

Radio Module (Tested inside of Panasonic Personal Computer FZ-40)

Model : WW21A (FCC ID ACJ9TGW21A / ISED certification number 216H-CFW21A)

| Wireless technologies                  | Dup.                              | Band                                                        | Mode                                                                                                                                                                                                                                                   |                                 |
|----------------------------------------|-----------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| WCDMA                                  | FDD                               |                                                             | 2 UMTS Rel. 99 (Data) HSDPA (Rel. 5)                                                                                                                                                                                                                   |                                 |
|                                        | FDD                               |                                                             | 4 HSUPA (Rel. 6), HSPA+ (Rel. 7), DC-HSDPA (Rel. 8)                                                                                                                                                                                                    |                                 |
|                                        | FDD                               |                                                             | 5                                                                                                                                                                                                                                                      |                                 |
| LTE                                    | FDD                               |                                                             | 2 QPSK, 16QAM, 64AQM, 256QAM                                                                                                                                                                                                                           |                                 |
|                                        | FDD                               |                                                             | 4                                                                                                                                                                                                                                                      |                                 |
|                                        | FDD                               |                                                             | 5 Downlink MIMO Support: Yes(2x2, 4x4)                                                                                                                                                                                                                 |                                 |
|                                        | *B42: not used in US (FCC)        | FDD                                                         | 7 Supported band : B2, B4, B7, B25, B38, B41, B42, B48, B66                                                                                                                                                                                            |                                 |
|                                        | FDD                               |                                                             | 12                                                                                                                                                                                                                                                     |                                 |
|                                        | *B48: not used in Canada(ISED)    | FDD                                                         | 13 Uplink MIMO Support: No                                                                                                                                                                                                                             |                                 |
|                                        | FDD                               |                                                             | 14 Uplink transmission is limited to a single output stream.                                                                                                                                                                                           |                                 |
|                                        | FDD                               |                                                             | 17                                                                                                                                                                                                                                                     |                                 |
|                                        | FDD                               |                                                             | 25                                                                                                                                                                                                                                                     |                                 |
|                                        | FDD                               |                                                             | 26                                                                                                                                                                                                                                                     |                                 |
|                                        | FDD(Rx only)                      |                                                             | 29                                                                                                                                                                                                                                                     |                                 |
|                                        | TDD                               |                                                             | 38                                                                                                                                                                                                                                                     |                                 |
|                                        | TDD                               |                                                             | 41                                                                                                                                                                                                                                                     |                                 |
|                                        | TDD                               |                                                             | 42                                                                                                                                                                                                                                                     |                                 |
|                                        | TDD(Rx only)                      |                                                             | 46                                                                                                                                                                                                                                                     |                                 |
|                                        | TDD                               |                                                             | 48                                                                                                                                                                                                                                                     |                                 |
|                                        | FDD                               |                                                             | 66                                                                                                                                                                                                                                                     |                                 |
|                                        | FDD                               |                                                             | 71                                                                                                                                                                                                                                                     |                                 |
| LTE CA                                 | Downlink                          |                                                             | Uplink                                                                                                                                                                                                                                                 |                                 |
|                                        | Maximum 7 carriers                |                                                             | *B42: not used in US (FCC) / B48: not used in Canada(ISED)<br>Maximum 2 carriers<br>Supported combination:<br><Intra-band contiguous><br>7C, 41C, 42C, 48C<br><Inter-band>2A-5A, 2A-12A, 2A-13A, 4A-5A, 4A-12A, 4A-13A, 5A-7A,5A-66A, 12A-66A, 13A-66A |                                 |
| 5G NR (FR1)                            | FDD                               | 15 kHz                                                      | n2 Pi/2 BPSK (DFT-s-OFDM),                                                                                                                                                                                                                             |                                 |
|                                        | FDD                               | 15 kHz                                                      | n5 QPSK (CP-OFDM/DFT-s-OFDM),                                                                                                                                                                                                                          |                                 |
|                                        | *n77, n78: not used in US (FCC)   | TDD                                                         | 15 kHz                                                                                                                                                                                                                                                 | n41 16QAM (CP-OFDM/DFT-s-OFDM), |
|                                        | FDD                               | 15 kHz                                                      | n66 64QAM (CP-OFDM/DFT-s-OFDM),                                                                                                                                                                                                                        |                                 |
|                                        | FDD                               | 15 kHz                                                      | n71 256QAM (CP-OFDM/DFT-s-OFDM)                                                                                                                                                                                                                        |                                 |
|                                        | TDD                               | 30 kHz                                                      | n77 Downlink MIMO Support: Yes(2x2, 4x4)                                                                                                                                                                                                               |                                 |
|                                        | TDD                               | 30 kHz                                                      | n78 Supported band : n2, n41, n66, n77, n78                                                                                                                                                                                                            |                                 |
|                                        | -                                 | -                                                           | - Uplink MIMO Support: No                                                                                                                                                                                                                              |                                 |
| -                                      | -                                 | - Uplink transmission is limited to a single output stream. |                                                                                                                                                                                                                                                        |                                 |
| EN-DC(LTE-FR1 Sub6)<br>(NSA mode only) | Supported combination             |                                                             | *n77, n78: not used in US (FCC)                                                                                                                                                                                                                        |                                 |
|                                        | LTE Anchor Bands for NR band n2   |                                                             | LTE Band 5/12/13                                                                                                                                                                                                                                       |                                 |
|                                        | LTE Anchor Bands for NR band n5   |                                                             | LTE Band 2/7/66                                                                                                                                                                                                                                        |                                 |
|                                        | LTE Anchor Bands for NR band n41  |                                                             | LTE Band 2/25/26/66                                                                                                                                                                                                                                    |                                 |
|                                        | LTE Anchor Bands for NR band n66  |                                                             | LTE Band 5/12/13/14/71                                                                                                                                                                                                                                 |                                 |
|                                        | LTE Anchor Bands for NR band n71  |                                                             | LTE Band 2/7/66                                                                                                                                                                                                                                        |                                 |
|                                        | LTE Anchor Bands for NR band n77* |                                                             | LTE Band 41                                                                                                                                                                                                                                            |                                 |
| LTE Anchor Bands for NR band n78*      |                                   | LTE Band 2/5/7/12/38/66                                     |                                                                                                                                                                                                                                                        |                                 |

Wireless module (Tested inside of Panasonic Personal Computer FZ-40)

Model : WL20B (FCC ID ACJ9TGWL20B / ISED certification number 216H-CFWL20B)

| Wireless technologies | Dup. | Band   |                                                  | Mode                                                                          |
|-----------------------|------|--------|--------------------------------------------------|-------------------------------------------------------------------------------|
| WLAN                  | TDD  | 2.4GHz | 2412-2472<br>for US<br>2412-2462<br>for Canada   | 802.11b<br>802.11g<br>802.11n(20,40)<br>802.11ax(20,40)                       |
|                       | TDD  | 5GHz   | 5180-5240<br>5260-5320<br>5500-5720<br>5745-5825 | 802.11a<br>802.11n(20,40)<br>802.11ac(20,40.80.160)<br>802.11ax(20,40.80.160) |
| Bluetooth             | TDD  | 2.4GHz | 2402-2480                                        | BR/EDR/LE                                                                     |

\*This report is for mmW range

### 3.3 mmW Antenna configuration

| WWAN<br>Antennas | 5G NR(FR2)          |
|------------------|---------------------|
|                  | Tx/Rx               |
| #0               | n258, n260 and n261 |
| #1               | n258, n260 and n261 |
| #2               | n258, n260 and n261 |

### 3.4 Time averaging for SAR and PD

The Qualcomm® Smart Transmit algorithm controls and manages the instantaneous Tx power to maintain the time-averaged Tx power (in turn, time-averaged RF exposure) is in compliance with regulatory limits.

This device uses Qualcomm® Smart Transmit feature and cannot operate without RF exposure characterization at the device level, beforehand. The parameters obtained from SAR and PD characterization (char), if any, is used as input for Smart Transmit. Both SAR char and PD char will be entered via the Embedded File System (EFS) to enable the Smart Transmit feature.

## 4 Test standard information

### 4.1 Test Specification

|                                     | Title           |                                                                                             |
|-------------------------------------|-----------------|---------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | FCC47CFR 2.1093 | RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices |

### 4.2 SAR Work Procedures Procedure

|                                     | Name of documents                                           | Title or details                                                                                                                                                                      |
|-------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | C/N: Work Instructions-<br>ULID-003598<br>Name:13-EM-W0429  | UL Japan, Inc.'s SAR Work Procedures Procedure                                                                                                                                        |
| <input checked="" type="checkbox"/> | C/N: Work Instructions-<br>ULID-003599<br>Name:13-EM-W0430  | UL Japan, Inc.'s SAR Work Procedures Procedure                                                                                                                                        |
| <input checked="" type="checkbox"/> | C/N: Work Instructions-<br>ULID-003619<br>Name: 13-EM-W0863 | UL Japan, Inc.'s PD Work Procedures Procedure                                                                                                                                         |
| <input type="checkbox"/>            | IEEE Std 1528-2013                                          | IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.     |
| <input checked="" type="checkbox"/> | IEC TR 63170 Edition 1.0                                    | Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz |

### 4.3 Additions or deviations to standard

Other than above, no addition, exclusion nor deviation has been made from the standard.

### 4.4 References

SPEAG. ( August 2018). *5G Module V1.2 Application Note: 5G Compliance Testing*.

SPEAG. (n.d.). *SPEAG uncertainty document (AN 15-7/AN19-17)*.

## 4.5 Limit

### 4.5.1 Below 6 GHz

#### (A) Limits for Occupational/Controlled Exposure (W/kg)

| Spatial Average<br>(averaged over the whole body) | Spatial Peak<br>(averaged over any 1 g of tissue) | Spatial Peak<br>(hands/wrists/feet/ankles averaged over 10 g) |
|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------|
| 0.4                                               | 8.0                                               | 20.0                                                          |

#### (B) Limits for General population/Uncontrolled Exposure (W/kg)

| Spatial Average<br>(averaged over the whole body) | Spatial Peak<br>(averaged over any 1 g of tissue) | Spatial Peak<br>(hands/wrists/feet/ankles averaged over 10 g) |
|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------|
| 0.08                                              | 1.6                                               | 4.0                                                           |

**Occupational/Controlled Environments:** are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. because of employment or occupation).

**General Population/Uncontrolled Environments:** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

### 4.5.2 Above 6 GHz

| Frequency Range<br>[MHz]                                      | Power Density<br>[mW/cm <sup>2</sup> ] | Average Time<br>[Minutes] |
|---------------------------------------------------------------|----------------------------------------|---------------------------|
| (A) Limits For Occupational / Controlled Environments         |                                        |                           |
| 1,500 – 100,000                                               | 5                                      | 6                         |
| (B) Limits For General Population / Uncontrolled Environments |                                        |                           |
| 1,500 – 100,000                                               | 1                                      | 30                        |

Note: 1.0 mW/cm<sup>2</sup> is 10 W/m<sup>2</sup>

## 5 Location

UL Japan, Inc. Ise EMC Lab.  
Shielded room for SAR testings  
A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919  
ISED SAR Lab Company Number: 2973C / CAB identifier: JP0002  
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN  
Telephone: +81-596-24-8999

## 6 Definitions, symbols, and abbreviations

### 6.1 Definitions

|                                       |                                                                                                                                                                      |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAR_design_target                     | : The SAR_design_target shall be less than regulatory SAR limit (i.e., 1gSAR limit for FCC) after accounting for all device design related uncertainties.            |
| SAR_design_target_extremity           | : SAR_design_target for limbs                                                                                                                                        |
| Tx_power_at_SAR_design_target         | : Transmit level that matches SAR_design_target ( $P_{\text{limit}}$ in dBm)                                                                                         |
| $\Delta_{\text{min}}$                 | : housing material influence                                                                                                                                         |
| PD_design_target                      | : The design target for PD compliance. It should be less than regulatory power density limit to account for all device design related uncertainties                  |
| input.power.limit                     | : For a PD characterized wireless device, the input power level at antenna port(s) for each beam corresponding to PD_design_target.                                  |
| PD char                               | : the table that contains input.power.limit fed to antenna port(s) for all supported beams.                                                                          |
| N beams                               | : The mmW device supports total N beams, where M out of N are single beams and the rest of (N-M) are beam pairs (where 2 single beams are excited at the same time). |
| power density (PD) or $S_{\text{av}}$ | : energy per unit time and unit area crossing a surface of area A characterized by the normal unit vector $\hat{\mathbf{n}}$ and averaging time.                     |

$$S_{\text{av}} = \frac{1}{AT} \iint (\mathbf{E} \times \mathbf{H}) \cdot \hat{\mathbf{n}} dA dT$$

|                                |                                                                                                                                                                                                                        |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specific Absorption Rate (SAR) | : The time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density ( $\rho$ ), as shown in the following equation: |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

$$\text{SAR} = \frac{d}{dt} \left( \frac{dW}{dm} \right) = \frac{d}{dt} \left( \frac{dW}{\rho dV} \right)$$

|              |                                                                                                                 |
|--------------|-----------------------------------------------------------------------------------------------------------------|
| Reported SAR | : Measured SAR is scaled to the maximum tune-up tolerance limit and the maximum duty by the following formulas. |
|--------------|-----------------------------------------------------------------------------------------------------------------|

$$\begin{aligned} \text{Reported SAR [w/kg]} \\ &= \text{Measured SAR [w/kg]} \times \text{scale factor for power} \\ &\times \text{Scaled factor for duty(if needed)} \end{aligned}$$

Where

$$\text{Scaled factor for power} = \frac{\text{Maximum tune up tolerance limit [mW]}}{\text{Measured power [mW]}}$$

And

$$\text{Scaled factor for duty} = \frac{1}{\text{Duty}}$$

Maximum Tune-up tolerance limit : Tolerance power specified by customer (P<sub>max</sub> or P<sub>limit</sub>)

## 6.2 Symbols

| Symbol                | Quantity                      | Unit                  | Dimensions                                 |
|-----------------------|-------------------------------|-----------------------|--------------------------------------------|
| E                     | Electric field                | volt per meter        | V / m                                      |
| f                     | Frequency                     | hertz                 | Hz                                         |
| H                     | Magnetic field                | ampere per meter      | A / m                                      |
| λ                     | Wavelength                    | meter                 | m                                          |
| S                     | Local power density           | watt per square meter | W / m <sup>2</sup>                         |
| PD or S <sub>av</sub> | Spatial-average power density | watt per square meter | W / m <sup>2</sup> (mW / cm <sup>2</sup> ) |
| SAR                   | Specific Absorption Rate      | watt per square meter | W / kg                                     |

## 6.3 Abbreviations

|                |                                                                 |                |                                                          |
|----------------|-----------------------------------------------------------------|----------------|----------------------------------------------------------|
| □              | NOT applicable.                                                 | GPS            | Global Positioning System                                |
| ☒              | applicable.                                                     | Hori.          | Horizontal                                               |
| A2LA           | The American Association for Laboratory Accreditation           | IEC            | International Electrotechnical Commission                |
| AC             | Alternating Current                                             | IEEE           | Institute of Electrical and Electronics Engineers        |
| AFH            | Adaptive Frequency Hopping                                      | IF             | Intermediate Frequency                                   |
| AM             | Amplitude Modulation                                            | ILAC           | International Laboratory Accreditation Conference        |
| Amp, AMP       | Amplifier                                                       | ISED           | Innovation, Science and Economic Development Canada      |
| ANSI           | American National Standards Institute                           | ISO            | International Organization for Standardization           |
| Ant, ANT       | Antenna                                                         | KDB            | Knowledge data base from Federal communication committee |
| AP             | Access Point                                                    | LAN            | Local Area Network                                       |
| Atten., ATT    | Attenuator                                                      | LIMS           | Laboratory Information Management System                 |
| AV             | Average                                                         | MCS            | Modulation and Coding Scheme                             |
| BPSK           | Binary Phase-Shift Keying                                       | MRA            | Mutual Recognition Arrangement                           |
| BR             | Bluetooth Basic Rate                                            | nG             | n generation (e.g. 3G,4G and 5G)                         |
| BS             | base station                                                    | NIST           | National Institute of Standards and Technology           |
| BT             | Bluetooth                                                       | NR             | New radio                                                |
| BT LE          | Bluetooth Low Energy                                            | OBW            | Occupied Band Width                                      |
| BW             | BandWidth                                                       | OFDM           | Orthogonal Frequency Division Multiplexing               |
| Cal Int        | Calibration Interval                                            | P/M            | Power meter                                              |
| CCK            | Complementary Code Keying                                       | PCB            | Printed Circuit Board                                    |
| Ch., CH        | Channel                                                         | PD             | Power density                                            |
| CISPR          | Comite International Special des Perturbations Radioelectriques | PER            | Packet Error Rate                                        |
| CW             | Continuous Wave                                                 | PHY            | Physical Layer                                           |
| DBPSK          | Differential BPSK                                               | PK             | Peak                                                     |
| DC             | Direct Current                                                  | PN             | Pseudo random Noise                                      |
| DFS            | Dynamic Frequency Selection                                     | PRBS           | Pseudo-Random Bit Sequence                               |
| DQPSK          | Differential QPSK                                               | PSD            | Power Spectral Density                                   |
| DSI            | Device state index                                              | QAM            | Quadrature Amplitude Modulation                          |
| DSSS           | Direct Sequence Spread Spectrum                                 | QP             | Quasi-Peak                                               |
| DUT            | Device under test                                               | QPSK           | Quadri-Phase Shift Keying                                |
| EDR            | Enhanced Data Rate                                              | RBW            | Resolution Band Width                                    |
| EIRP, e.i.r.p. | Equivalent Isotropically Radiated Power                         | RDS            | Radio Data System                                        |
| EMC            | ElectroMagnetic Compatibility                                   | RE             | Radio Equipment                                          |
| EMI            | ElectroMagnetic Interference                                    | RF             | Radio Frequency                                          |
| EN             | European Norm                                                   | RMS            | Root Mean Square                                         |
| ERP, e.r.p.    | Effective Radiated Power                                        | Rx             | Receiving                                                |
| EU             | European Union                                                  | SA, S/A        | Spectrum Analyzer                                        |
| EUT            | Equipment Under Test                                            | SG             | Signal Generator                                         |
| Fac.           | Factor                                                          | S <sub>n</sub> | Surface number                                           |
| FCC            | Federal Communications Commission                               | SVSWR          | Site-Voltage Standing Wave Ratio                         |
| FHSS           | Frequency Hopping Spread Spectrum                               | TER            | Total exposure ratio                                     |
| FM             | Frequency Modulation                                            | TR             | Test Receiver                                            |
| Freq.          | Frequency                                                       | Tx             | Transmitting                                             |
| GFSK           | Gaussian Frequency-Shift Keying                                 | VBW            | Video BandWidth                                          |
| GNSS           | Global Navigation Satellite System                              | Vert.          | Vertical                                                 |
| EN-DC          | E-UTRAN New Radio - Dual Connectivity                           | WLAN           | Wireless LAN                                             |

## 7 Test result

### 7.1 verdict

Complied

Highest values at each band are listed next section.

### 7.2 Stand-alone PD result

Highest reported PD = 7.30 W/m<sup>2</sup>

Highest measured PD = 7.17 W/m<sup>2</sup>

| Band | Measured PD<br>[W/m <sup>2</sup> ] | Reported PD<br>[W/m <sup>2</sup> ] |
|------|------------------------------------|------------------------------------|
| n258 | 7.17                               | 7.30                               |
| n261 | 7.00                               | 7.30                               |
| n260 | 7.01                               | 7.30                               |

Reported PD [W/m<sup>2</sup>] =  $10^{(\text{device uncert[dB]} / 10)} * PD\_design\_target * Duty = 10^{(0.21)} * 6 * 75 \% = 7.30$  module #0,1,2

Note that 75% factor corresponds to 3dB *reserve\_power\_margin*

### 7.3 Simultaneous transmission SAR result

5G NR FR2 n258, n260 and n261 cannot transmit simultaneously.

See section 12

## 7.4 Measurement Uncertainty

| Error Description                                                       | Uncert.<br>value (dB) | Probab.<br>Distri. | Div. | (c <sub>i</sub> ) | Std. Unc.<br>(± dB) | (v <sub>i</sub> )<br>v <sub>eff</sub> |
|-------------------------------------------------------------------------|-----------------------|--------------------|------|-------------------|---------------------|---------------------------------------|
| <b>Uncertainty terms dependent on the measurement system</b>            |                       |                    |      |                   |                     |                                       |
| Calibration                                                             | ± 0.49                | N                  | 1    | 1                 | 0.49                | ∞                                     |
| Probe correction                                                        | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Frequency response (BW ≤ 1 GHz)                                         | ± 0.20                | R                  | √3   | 1                 | 0.12                | ∞                                     |
| Sensor cross coupling                                                   | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Isotropy                                                                | ± 0.50                | R                  | √3   | 1                 | 0.29                | ∞                                     |
| Linearity                                                               | ± 0.20                | R                  | √3   | 1                 | 0.12                | ∞                                     |
| Probe scattering                                                        | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Probe positioning o<br>set                                              | ± 0.30                | R                  | √3   | 1                 | 0.17                | ∞                                     |
| Probe positioning repeatability                                         | ± 0.04                | R                  | √3   | 1                 | 0.02                | ∞                                     |
| Sensor mechanical o<br>set                                              | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Probe spatial resolution                                                | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Field impedance dependance                                              | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Amplitude and phase drift                                               | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Amplitude and phase noise                                               | ± 0.04                | R                  | √3   | 1                 | 0.02                | ∞                                     |
| Measurement area truncation                                             | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Data acquisition                                                        | ± 0.03                | N                  | 1    | 1                 | 0.03                | ∞                                     |
| Sampling                                                                | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Field reconstruction                                                    | ± 0.95                | R                  | √3   | 1                 | 0.55                | ∞                                     |
| Forward transformation                                                  | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Power density scaling                                                   | -                     | R                  | √3   | 1                 | -                   | ∞                                     |
| Spatial averaging                                                       | 0.10                  | R                  | √3   | 1                 | 0.06                | ∞                                     |
| System detection limit                                                  | ± 0.04                | R                  | √3   | 1                 | 0.02                | ∞                                     |
| <b>Uncertainty terms dependent on the DUT and environmental factors</b> |                       |                    |      |                   |                     |                                       |
| Probe coupling with DUT                                                 | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Modulation response                                                     | ± 0.40                | R                  | √3   | 1                 | 0.23                | ∞                                     |
| Integration time                                                        | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Response time                                                           | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Device holder influence                                                 | ± 0.10                | R                  | √3   | 1                 | 0.06                | ∞                                     |
| DUT alignment                                                           | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| RF ambient conditions                                                   | ± 0.04                | R                  | √3   | 1                 | 0.02                | ∞                                     |
| Ambient reflections                                                     | ± 0.04                | R                  | √3   | 1                 | 0.02                | ∞                                     |
| Immunity / secondary reception                                          | ± 0.00                | R                  | √3   | 1                 | 0.00                | ∞                                     |
| Drift of the DUT                                                        | ± 0.21                | R                  | √3   | 1                 | 0.12                | ∞                                     |
| Combined Std. Uncertainty                                               |                       |                    |      |                   | 0.87                | ∞                                     |
| Expanded STD Uncertainty (k = 2)                                        |                       |                    |      |                   | 1.74                |                                       |

## 8 Software information, Tune up tolerance limit, $P_{\text{limit}}$ and input.power.limit

### 8.1 Software information

\*The power value of the EUT was set for testing as follows (setting value might be different from product specification value);  
Software: QRCT version 4.0

\*This setting of software is the worst case.

The test was performed with condition that obtained the maximum average power (Burst) in pre-check.

Any conditions under the normal use do not exceed the condition of setting.

In addition, end users cannot change the settings of the output power of the product.

### 8.2 Input Power Limit

The input.power.limit used in this report are determined and listed in Part 0 report, details is shown also part 0.

## 9 PD Exposure Conditions (Test Configurations)

the PD measurement is made all channels and all applicable surfaces determined through the validated simulation approach, see Part 0 report.

The following beam selection criteria is used:

Select at least one single beam (antenna array config) per antenna type and module

The single beam containing highest number of active antenna ports. For example, the single beam with 4 active patch ports should be selected over the beam with a single active patch port

Select at least one beam pair (if applicable) per antenna module and type. The beam pair containing the highest number of active antenna ports.

If the Tx polarization diversity is supported, the selected beam pair(s) needs to be tested with Tx polarization diversity in both enabled and disabled scenario.

Table 9-1 tested configuration

| Module ID | Active port # | Ant type | Test surface |
|-----------|---------------|----------|--------------|
| 0         | 4             | patch    | Edge2        |
| 1         | 4             | patch    | Keyboard     |
| 2         | 4             | patch    | Edge1        |

## 10 PD System Check

### 10.1 Dielectric Property

Media is air so Relative Permittivity ( $\epsilon_r$ ) and Conductivity ( $\sigma$ ) are 1 and 0 respectively.

### 10.2 System Check

System validation is required before a system is deployed for measurement

Peak and spatially averaged power density at the peak location(s) must be compared to calibrated results according to the defined test conditions

- the same spatial resolution and measurement region used in the waveguide calibration should be applied to system validation and system check
- power density distribution should also be verified, both spatially (shape) and numerically (level) through visual inspection for noticeable differences
- the measured results should be within 0.66 dB\* of the calibrated targets

\* Within 0.66 dB is recommended by SPEAG(Schmid & Partner Engineering AG).

### 10.3 Setting

Then create a measurement file with a test distance of 10mm for 10 GHz and 5.55mm for 30 GHz and above (the later will account for the retracted location of the horn aperture towards the top surface of a verification source). Use the scan settings defined in below table.

Grid setting

| Frequency [GHz] | Grid step                    | Grid extent X/Y [mm] | Measurement points |
|-----------------|------------------------------|----------------------|--------------------|
| 10              | 0.25 ( $\frac{\lambda}{4}$ ) | 120/120              | 18 × 18            |
| 30              | 0.25 ( $\frac{\lambda}{4}$ ) | 60/60                | 26 × 26            |
| 45              | 0.25 ( $\frac{\lambda}{4}$ ) | 42/42                | 28 × 28            |
| 60              | 0.25 ( $\frac{\lambda}{4}$ ) | 32.5/32.5            | 28 × 28            |
| 90              | 0.25 ( $\frac{\lambda}{4}$ ) | 30/30                | 38 × 38            |

Table 10-1 PD system check result

| Date | Frequency [MHz] | Temp [deg. C] | Humid [% RH] | E/H-Field Probe | Verification source | Phantom | 4cm2 (Circular PDtot) [W/m2] | 4cm2 (Square Pdtot) [W/m2] | (SPEAG) 4cm2 (Circular PDtot) [W/m2] | (SPEAG) 4cm2 (Square PD tot) [W/m2] | Dev. 4cm2 (Circular PDtot) [dB] | Dev. 4cm2 (Square Pdtot) [dB] | Visual Inspection |
|------|-----------------|---------------|--------------|-----------------|---------------------|---------|------------------------------|----------------------------|--------------------------------------|-------------------------------------|---------------------------------|-------------------------------|-------------------|
| 3/8  | 30000           | 23            | 30           | MPBm-01         | MVSm-01             | 5G      | 38.8                         | 38.6                       | 43.1                                 | 42.9                                | -0.46                           | -0.46                         | OK                |
| 3/9  | 30000           | 23            | 30           | MPBm-01         | MVSm-01             | 5G      | 38.8                         | 38.7                       | 43.1                                 | 42.9                                | -0.46                           | -0.45                         | OK                |
| 3/10 | 30000           | 23            | 30           | MPBm-01         | MVSm-01             | 5G      | 38.2                         | 38.1                       | 43.1                                 | 42.9                                | -0.52                           | -0.52                         | OK                |
| 3/14 | 30000           | 22            | 40           | MPBm-01         | MVSm-01             | 5G      | 37.6                         | 37.5                       | 43.1                                 | 42.9                                | -0.59                           | -0.58                         | OK                |
| 3/15 | 30000           | 24            | 40           | MPBm-01         | MVSm-01             | 5G      | 38.0                         | 37.9                       | 43.1                                 | 42.9                                | -0.55                           | -0.54                         | OK                |
| 3/16 | 30000           | 21            | 35           | MPBm-01         | MVSm-01             | 5G      | 38.6                         | 38.5                       | 43.1                                 | 42.9                                | -0.48                           | -0.47                         | OK                |

MPBm-01, MVSm-01 details are shown section 13.

## 11 PD Measurements

### 11.1 PD worst surface result

Worst surface

| Band | Module #. | Freq.<br>Ch | MHz      | Beam ID |     | input.power.limit<br>[dBm] | Mode | EUT surface | Day       | S <sub>total</sub><br>W/m <sup>2</sup> | S <sub>norm</sub><br>W/m <sup>2</sup> | Power drift<br>[dB] | Plot # |
|------|-----------|-------------|----------|---------|-----|----------------------------|------|-------------|-----------|----------------------------------------|---------------------------------------|---------------------|--------|
| n258 | 0         | L-Mid,      | 24400.00 | 21      |     | 2.9                        | CW   | Edge 2      | 2022/3/8  | 5.31                                   | 4.3                                   | 0.08                |        |
| n258 | 0         | L-Mid,      | 24400.00 | 149     |     | 3.2                        | CW   | Edge 2      | 2022/3/8  | 5.67                                   | 4.58                                  | -0.03               |        |
| n258 | 0         | L-Mid,      | 24400.00 | 21      | 149 | 0.3                        | CW   | Edge 2      | 2022/3/8  | 7.03                                   | 5.77                                  | -0.11               |        |
| n258 | 1         | L-Mid,      | 24400.00 | 38      |     | 3.2                        | CW   | Keyboard    | 2022/3/15 | 7.02                                   | 5.63                                  | -0.01               |        |
| n258 | 1         | H-Mid,      | 24799.98 | 153     |     | 3.4                        | CW   | Keyboard    | 2022/3/15 | 6.08                                   | 4.51                                  | -0.02               |        |
| n258 | 1         | L-Mid,      | 24400.00 | 26      | 154 | 0.4                        | CW   | Keyboard    | 2022/3/15 | <b>7.17</b>                            | <b>6.17</b>                           | -0.16               | 1      |
| n258 | 2         | L-Mid,      | 24400.00 | 45      |     | 3.8                        | CW   | Edge1       | 2022/3/9  | 5.44                                   | 3.98                                  | -0.05               |        |
| n258 | 2         | High,       | 25200.00 | 162     |     | 4.2                        | CW   | Edge1       | 2022/3/9  | 5.34                                   | 3.44                                  | -0.17               |        |
| n258 | 2         | High,       | 25200.00 | 32      | 160 | 1.0                        | CW   | Edge1       | 2022/3/10 | 5.19                                   | 4.54                                  | -0.11               |        |

| Band | Module #. | Freq.<br>Ch | MHz      | Beam ID |     | input.power.limit<br>[dBm] | Mode | EUT surface | Day       | S <sub>total</sub><br>W/m <sup>2</sup> | S <sub>nom</sub><br>W/m <sup>2</sup> | Power drift<br>[dB] | Plot # |
|------|-----------|-------------|----------|---------|-----|----------------------------|------|-------------|-----------|----------------------------------------|--------------------------------------|---------------------|--------|
| n261 |           | 0 Low.      | 27559.32 | 21      |     | 4.5                        | CW   | Edge 2      | 2022/3/8  | 6.62                                   | 5.44                                 | -0.19               |        |
| n261 |           | 0 Low.      | 27559.32 | 153     |     | 4.8                        | CW   | Edge 2      | 2022/3/8  | <b>7.00</b>                            | 5.63                                 | -0.15               | 2      |
| n261 |           | 0 Low.      | 27559.32 | 21      | 149 | 1.5                        | CW   | Edge 2      | 2022/3/9  | 6.73                                   | 5.43                                 | -0.2                |        |
| n261 |           | 1 Low.      | 27559.32 | 30      |     | 4.2                        | CW   | Keyboard    | 2022/3/15 | 6.80                                   | 5.19                                 | -0.15               |        |
| n261 |           | 1 Low.      | 27559.32 | 154     |     | 4.4                        | CW   | Keyboard    | 2022/3/15 | 4.51                                   | 3.43                                 | 0.03                |        |
| n261 |           | 1 Low.      | 27559.32 | 26      | 154 | 0.9                        | CW   | Keyboard    | 2022/3/15 | 3.93                                   | 3.43                                 | -0.11               |        |
| n261 |           | 2 Low.      | 27559.32 | 31      |     | 5.0                        | CW   | Edge 1      | 2022/3/10 | 6.80                                   | 5.35                                 | 0.12                |        |
| n261 |           | 2 Low.      | 27559.32 | 159     |     | 4.6                        | CW   | Edge 1      | 2022/3/10 | 5.64                                   | 4.12                                 | -0.13               |        |
| n261 |           | 2 Low.      | 27559.32 | 33      | 161 | -0.3                       | CW   | Edge 1      | 2022/3/10 | 6.27                                   | <b>6.00</b>                          | 0.13                |        |

| Band | Module #. | Freq.<br>Ch | MHz      | Beam ID |     | input.power.limit<br>[dBm] | Mode | EUT surface | Day       | S <sub>total</sub><br>W/m <sup>2</sup> | S <sub>norm</sub><br>W/m <sup>2</sup> | Power drift<br>[dB] | Plot # |
|------|-----------|-------------|----------|---------|-----|----------------------------|------|-------------|-----------|----------------------------------------|---------------------------------------|---------------------|--------|
| n260 | 0         | Mid.        | 38498.88 | 37      |     | 3.8                        | CW   | Edge 2      | 2022/3/9  | 6.23                                   | 5.04                                  | -0.09               |        |
| n260 | 0         | Mid.        | 38498.88 | 165     |     | 4.1                        | CW   | Edge 2      | 2022/3/9  | 6.87                                   | 5.49                                  | -0.04               |        |
| n260 | 0         | Mid.        | 38498.88 | 25      | 153 | 1.0                        | CW   | Edge 2      | 2022/3/9  | <b>7.01</b>                            | <b>5.61</b>                           | -0.12               | 3      |
| n260 | 1         | Mid.        | 38498.88 | 42      |     | 3.8                        | CW   | Keyboard    | 2022/3/14 | 6.08                                   | 5.03                                  | -0.14               |        |
| n260 | 1         | Mid.        | 38498.88 | 156     |     | 4.1                        | CW   | Keyboard    | 2022/3/14 | 5.88                                   | 4.91                                  | 0.06                |        |
| n260 | 1         | Mid.        | 38498.88 | 41      | 169 | 0.7                        | CW   | Keyboard    | 2022/3/15 | 5.91                                   | 5.13                                  | -0.06               |        |
| n260 | 2         | Mid.        | 38498.88 | 161     |     | 4.1                        | CW   | Edge 1      | 2022/3/14 | 5.85                                   | 4.91                                  | 0.12                |        |
| n260 | 2         | Mid.        | 38498.88 | 45      |     | 3.4                        | CW   | Edge 1      | 2022/3/14 | 5.91                                   | 5.01                                  | -0.14               |        |
| n260 | 2         | Mid.        | 38498.88 | 44      | 172 | 0.2                        | CW   | Edge 1      | 2022/3/16 | 5.61                                   | 4.49                                  | -0.03               |        |

## 12 PD simultaneous transmission consideration

### 12.1 Total exposure ratio (TER)

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 all active WWAN radios are collocated. Therefore, for a total of 100% exposure margin, if primary radio uses x%, then the exposure margin left for secondary radio(s) is capped to (100-x)%. Thus, the compliance equation for simultaneous active WWAN radios, such as LTE + 5G NR, is

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

where, **A** is normalized time-averaged SAR from primary radio (i.e. LTE), and  $A \leq 1.0$ ; **B** for secondary radio (i.e. NR) is

- (for legacy radio or sub6 NR): normalized time-averaged SAR exposure
- (for mmW NR): *PD\_design\_target* + device uncertainty (in a normalized term),

and  $B \leq 1.0$ .

The total RF exposure in this simultaneous transmission scenario is controlled and managed within Smart Transmit operation, and the compliance is demonstrated in Part 2 test.

Let **C** = normalized *reported* SAR exposure ratio from WLAN + WLAN or WLAN+BT, then

If there is only one active WWAN radio in Smart Transmit, then

$$A + C \leq 1.0 \text{ for compliance}$$

Else,

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

Because  $x\% * A + (100-x)\% * B \leq x\% * \max(A, B) + (100-x)\% * \max(A, B)$ , leading to  $x\% * A + (100-x)\% * B \leq \max(A, B)$ , Above equation can be rewritten as

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

if  $A + C \leq 1.0$  and  $B + C \leq 1.0$  can be proven, then RF exposure in simultaneous transmission meets Equation, i.e.,

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

Thus, in a case of 5G NR + LTE + WLAN + BT, simultaneous transmission analysis can be performed in two steps,

Step 1: Prove total exposure ratio (TER) of  $A(\text{LTE}) + C(\text{WLAN} + \text{BT}) < 1.0$

Step 2: Prove total exposure ratio (TER) of  $B(5G \text{ NR}) + C(\text{WLAN} + \text{BT}) < 1.0$

Once the above Step1 ( $A + C \leq 1.0$ ) and Step2 ( $B + C \leq 1.0$ ) conditions are met, the 5G NR + LTE + WLAN + BT simultaneous transmission complies with FCC requirement of TER less than 1.0.

For 5G mmW NR, compute *reported time-averaged PD* =  $75\% * PD\_design\_target * 10^{(\text{mmW device design uncertainty in dB}/10)}$  and use this computed *reported time-averaged PD* in total exposure ratio (TER) analysis.

Note that 75 % factor corresponds to 3dB *reserve\_power\_margin*. For other *reserve\_power\_margin* settings, obtain the scaling factor from Qualcomm®. Here, 75 % reserve factor corresponds to Smart Transmit EFS version 15 or below. For EFS version 16 (or higher), secondary radio (5G mmW NR) can get up to 100 % reserve factor irrespective of *reserve\_power\_margin* setting. So, in the below analysis, replace 75 % with 100 % reserve factor in case of EFS version 16 (or higher).

## 12.2 PD simultaneous transmission compliance consideration

| Tx 1                                                       | Tx 2                                                                                      | Tx 3                                      |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------|
| mmW 5G<br>Maximum Reported PD:<br>7.30 [W/m <sup>2</sup> ] | WLAN-main<br>Maximum Reported SAR<br>Bottom: 0.186 [W/kg] *1<br>Keyboard: 0.805 [W/kg] *2 | WLAN-BT<br>Maximum ERP:<br>162.93 [mW] *2 |

\*1: This is the maximum output power for the WLAN module as taken from test report HCT-SR-2112-FC005-R1 which was submitted to support a C2PC for the WLAN module (FCC ID: ACJ9TGWL20B) in the FZ-40 laptop (grant issued 23/05/2022).

\*2: Results for the WLAN module are taken from test report 1413146H-B which was submitted to support a C2PC for the WWAN module (FCC ID: ACJ9TGWW21A) in the FZ-40 laptop (grant issued 06/03/2021) where extremity SAR was assessed at the keyboard position for both WLAN and WWAN modules in accordance with the test plan approved through KDB inquiry.

WLAN-main + WLAN-BT

| Position | WLAN                                                        |                                           |                  |
|----------|-------------------------------------------------------------|-------------------------------------------|------------------|
|          | WLAN-main Ratio<br>(Maximum<br>Reported SAR /<br>SAR limit) | WLAN-BT Ratio<br>(Maximum ERP /<br>ERPth) | WLAN total ratio |
| Bottom   | 0.116                                                       | 0.053                                     | 0.169            |
| Keyboard | 0.201                                                       | 0.021                                     | 0.223            |

SAR limit for Body is 1.6 W/kg

SAR limit for Limbs is 4.0 W/kg

$$P_{th}(mW) = ERP_{20\ cm}(mW) = \begin{cases} 2040f & 0.3\text{ GHz} \leq f < 1.5\text{ GHz} \\ 3060 & 1.5\text{ GHz} \leq f \leq 6\text{ GHz} \end{cases}$$

Sample calc. Ratio = WLAN Ant 1 SAR result [W/kg] / 1.6 or 4.0 [W/kg] + WLAN Ant 2 ERP [mW] / ERPth [mW]

mmW 5G + WLAN-main + WLAN-BT  
Module 0/1/2

| Position | Maximum PD<br>Ratio | Maximum WLAN<br>Ratio | TER   |
|----------|---------------------|-----------------------|-------|
| Bottom   | 0.730               | 0.169                 | 0.899 |
| Keyboard | 0.730               | 0.223                 | 0.953 |

Sample calc. TER = PD ratio to limit + other transmitter ratio to limit.

Listed only worst case.

Maximum TER = 0.95

## 12.3 Conclusion

TER is compliant with FCC exposure limit, TER less than 1.0.

## 13 Test instrument

### 13.1 For PD measurement

| Local Id      | LIMS ID | Description                  | Manufacturer                    | Model                         | Serial       | Last Cal Date | Interval |
|---------------|---------|------------------------------|---------------------------------|-------------------------------|--------------|---------------|----------|
| COTS-MSARm-01 | 186096  | cDASY6 Module mmWave         | Schmid & Partner Engineering AG | cDASY6 Module mmWave          | -            | -             | -        |
| MOS-31        | 141570  | Thermo-Hygrometer            | CUSTOM. Inc                     | CTH-201                       | 3101         | 2021/07/08    | 12       |
| MRBT-04       | 142249  | SAR robot                    | Schmid & Partner Engineering AG | TX60 Lspeag                   | F13/5PP1A1/A | 2021/04/20    | 12       |
| MDAE-02       | 141483  | Data Acquisition Electronics | Schmid & Partner Engineering AG | DAE4                          | 1369         | 2021/05/11    | 12       |
| MFPm-01       | 186095  | mmWave Phantom               | Schmid & Partner Engineering AG | QD 015 025 CA                 | 1038         | -             | -        |
| MPBm-01       | 186090  | mmWave probe                 | Schmid & Partner Engineering AG | EUmmWV4                       | 9450         | 2021/11/11    | 12       |
| MPBmD-01      | 186091  | Dummy probe 5G               | Schmid & Partner Engineering AG | SP DP2 002 AA                 | -            | -             | -        |
| MVSm-01       | 186093  | Verification Source          | Schmid & Partner Engineering AG | 5G Verification Source 30 GHz | 1053         | 2021/12/20    | 12       |

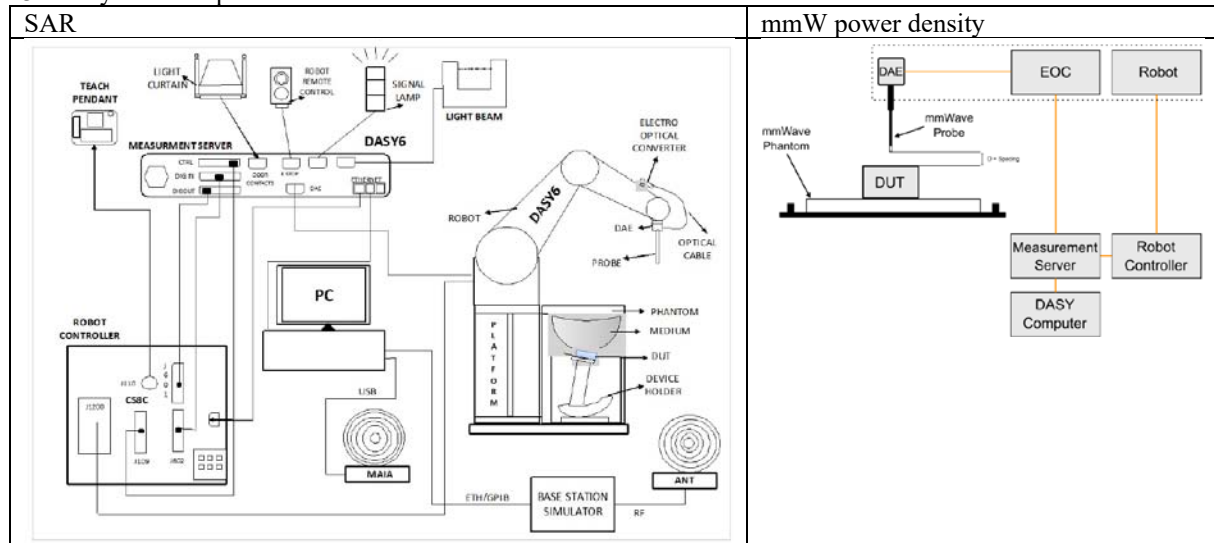
The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

## 13.2 Test system

### 13.2.1 System components



#### 13.2.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE4 or DAE3) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter, and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

#### 13.2.3 Probe (mmWave)

Two dipoles optimally arranged to obtain pseudo-vector information Minimum 3 measurements/point, 120 ° rotated around probe axis Sensors (0.8 mm length) printed on glass substrate protected by high density foam Low perturbation of the measured field Requires positioner which can do accurate probe rotation

#### 13.2.4 EOC

The electrooptical converter (EOC), which is mounted on the robot arm. An internal data link is used from the EOC to the robot back panel. From there, a 10-meter cable connects to the measurement server DAE input.

#### 13.2.5 Robot

The DASY6 system uses the high precision industrial robots TX60L from Stuaubli SA (France).

#### 13.2.6 Others

The SAR phantom, mmW phantom, the device holder and other accessories according to the targeted measurement.

## 14 Appendixes

Refer to separated files for the following appendixes.

Appendix A: DUT and SAR Setup Photos

Appendix B: PD Measurement data

Appendix C: System Check (PD)

Appendix D: Calibration data

Appendix E: Antenna location

## 15 Revision History

### Original Test Report No.: 14131461H-H

This report is a revised version of 14131461H-H. 14131461H-H is replaced with this report.

| Revision        | Test Report No. | Date         | Page Revised Contents                                |
|-----------------|-----------------|--------------|------------------------------------------------------|
| -<br>(Original) | 14131461H-H     | May 9, 2022  | -                                                    |
| 1               | 14131461H-H-R1  | July 6, 2022 | Clause 12.2<br>Modified contents for notes *1 and *2 |

End of Report