

# PARTIAL Test Report

## 21-1-0165307T03a



Deutsche  
Akkreditierungsstelle  
D-PL-12047-01-01  
D-PL-12047-01-03  
D-PL-12047-01-04

|                                                  |                                                                                                                                                                                                                                                                                                                                         |                 |                                   |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------|
| Number of pages:                                 | 17                                                                                                                                                                                                                                                                                                                                      | Date of Report: | 2023-Jan-20                       |
| Testing company:                                 | CETECOM GmbH<br>Im Teelbruch 116<br>45219 Essen Germany<br>Tel. + 49 (0) 20 54 / 95 19-0<br>Fax: + 49 (0) 20 54 / 95 19-150                                                                                                                                                                                                             | Applicant:      | Continental Advanced Antenna GmbH |
| Product:                                         | RKE Module Base FCC                                                                                                                                                                                                                                                                                                                     |                 |                                   |
| Model:                                           | RKE223E1                                                                                                                                                                                                                                                                                                                                |                 |                                   |
| Contains FCC ID:                                 | 2ACC7RKE223E1                                                                                                                                                                                                                                                                                                                           | Contains IC:    | 11980A-RKE223E1                   |
| Testing has been carried out in accordance with: | <b>FCC Regulations:</b> Title 47 CFR, Chapter I, Subchapter A, Subpart C: Part §15.231<br><b>ISED Regulations:</b> RSS-210, Issue 10, Annex A.1<br><br>Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".                                     |                 |                                   |
| Tested Technology:                               | SRD                                                                                                                                                                                                                                                                                                                                     |                 |                                   |
| Test Results:                                    | <input checked="" type="checkbox"/> <b>The EUT complies with the requirements in respect of selected parameters subject to the test.</b><br>The test results relate only to devices specified in this document                                                                                                                          |                 |                                   |
| Signatures:                                      | <div><br/>Ninovic Perez<br/>Test Lab Manager<br/>Authorization of test report</div> <div><br/>Timo Franke<br/>Test Manager<br/>Responsible of test report</div> |                 |                                   |

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## **1 General information**

### **1.1 Disclaimer and Notes**

The test results of this test report relate exclusively to the test item specified in this test report as specified in chapter 2.7. CETECOM does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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Also we refer on special conditions which the applicant should fulfill according §2.927 to §2.948, special focus regarding modification of the equipment and availability of sample equipment for market surveillance tests.

### **1.2 Attestation**

I declare that all measurements were performed by me or under my supervision and that all measurements have been performed and are correct to my best knowledge and belief to Industry Canada standards. All of the above requirements are met in accordance with enumerated standards.

### 1.3 Summary of Test Results

| Test case                                                                                               | Reference in FCC ☒             | Reference in ISED ☒                                       | Page | Remark                           | Result |
|---------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------|------|----------------------------------|--------|
| Radiated field strength emissions below 30 MHz                                                          | §15.205(a)<br>§15.209(a)       | GSS-Gen: Issue 5<br>Chapter 8.9 Table 6                   | --   | See initial module report        | NP     |
| <a href="#">Radiated field strength emissions 30 MHz – 1 GHz (Inclusive fundamental field strength)</a> | §15.231(b)<br>§15.33<br>§15.35 | RSS-210, Issue 10,<br>A.1.2, Table A.1                    | 9    | From 2 <sup>nd</sup> harmonic up | PASSED |
| <a href="#">Radiated field strength emissions above 1 GHz</a>                                           | §15.231(b)<br>§15.33<br>§15.35 | RSS-210, Issue 10,<br>A.1.2, Table A.1                    | 12   | Till 6 <sup>th</sup> harmonic    | PASSED |
| Transmitter timing:<br>1. Deactivation of transmission<br>2. Periodic transmission                      | §15.231<br>(a)(1)(2)(3)        | RSS-210, Issue 10<br>A.1.1                                | --   | See initial module report        | NP     |
| 20 dBc bandwidth                                                                                        | §15.231(c)                     | --                                                        | --   | See initial module report        | NP     |
| 99% bandwidth                                                                                           | §2.1049                        | RSS-210, Issue 10,<br>§A.1.3<br>RSS-Gen, Issue 5,<br>§6.7 | --   | See initial module report        | NP     |

PASSED

The EUT complies with the essential requirements in the standard.

FAILED

The EUT does not comply with the essential requirements in the standard.

N/A

Test case does not apply to the test object.

NP

The test was not performed by the CETECOM Laboratory.

Decision Rule: CETECOM GmbH follows [ILAC G8:2019 chapter 4.2.1 \(Simple Acceptance Rule\)](#).

Remarks:

- Please check the module report "CETECOM\_TR18-1-0257101T93a\_C2" for not performed Measurements by the CETECOM laboratory.

### 1.4 Summary of Test Methods

| Test case                                        | Test method                          |
|--------------------------------------------------|--------------------------------------|
| Radiated field strength emissions below 30 MHz   | ANSI C63.10-2013, chapter §6.3, §6.4 |
| Radiated field strength emissions 30 MHz – 1 GHz | ANSI C63.10-2013, chapter §6.3, §6.5 |
| Radiated field strength emissions above 1 GHz    | ANSI C63.10-2013, chapter §6.3, §6.6 |
| 20 dBc bandwidth, 99% bandwidth                  | ANSI C63.10-2013, chapter §6.3, §6.9 |

## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory

|                                     |                                                       |
|-------------------------------------|-------------------------------------------------------|
| Company name:                       | CETECOM GmbH                                          |
| Address:                            | Im Teelbruch 116<br>45219 Essen - Kettwig<br>Germany  |
| Responsible for testing laboratory: | Dipl.-Ing. Ninovic Perez                              |
| Accreditation scope:                | <b>DAkkS Webpage:</b> <a href="#">FCC ISED</a>        |
| IC Lab company No. / CAB ID:        | 3462D / DE0005                                        |
| Test location:                      | CETECOM GmbH; Im Teelbruch 116; 45219 Essen - Kettwig |

### 2.2 General limits for environmental conditions

|                     |           |
|---------------------|-----------|
| Temperature:        | 22±2 °C   |
| Relative. humidity: | 45±15% rH |

### 2.3 Test Laboratories sub-contracted

|               |    |
|---------------|----|
| Company name: | -- |
|---------------|----|

### 2.4 Organizational Items

|                           |                            |
|---------------------------|----------------------------|
| Responsible test manager: | Timo Franke                |
| Receipt of EUT:           | 2022-Mar-28                |
| Date(s) of test:          | 2022-Oct-03 to 2022-Okt-03 |
| Version of template:      | 22.0901                    |

### 2.5 Applicant's details

|                         |                                                                |
|-------------------------|----------------------------------------------------------------|
| Applicant's name:       | Continental Advanced Antenna GmbH                              |
| Address:                | Bahnhofstraße 23<br>83022 Rosenheim<br>Lower Saxony<br>Germany |
| Contact Person:         | Thomas Schuhbeck                                               |
| Contact Person's Email: | Thomas.Schuhbeck@continental-corporation.com                   |

### 2.6 Manufacturer's details

|                      |                                                                |
|----------------------|----------------------------------------------------------------|
| Manufacturer's name: | Continental Advanced Antenna, Sociedade Unipessoal Lda         |
| Address:             | Rua Professor Anton Kathrein<br>5000-082 Vila Real<br>Portugal |

## 2.7 Equipment under Test (EUT)

| EUT No. *) | Sample No.        | Product                | Model    | Type                  | SN     | HW                 | SW    |
|------------|-------------------|------------------------|----------|-----------------------|--------|--------------------|-------|
| EUT 1      | 21-1-01653S35_C01 | RKE Module Base<br>FCC | RKE223E1 | Application<br>sample | 000131 | 13612160B<br>08V00 | 11.31 |

\*) EUT short description is used to simplify the identification of the EUT in this test report.

## 2.8 Untested Variant (VAR)

| VAR No. *) | Sample No. | Product | Model | Type | SN | HW | SW |
|------------|------------|---------|-------|------|----|----|----|
|------------|------------|---------|-------|------|----|----|----|

\*) The listed additional untested model variant(s) (VAR) is/are not object of evaluation of compliance. For further information please see Annex 5: Declaration of applicant of model differences.

If the table above does not show any other line than the headline, no untested variants are available.

## 2.9 Auxiliary Equipment (AE)

| AE No. *) | Sample No.        | Auxiliary Equipment | Model                         | SN        | HW  | SW          |
|-----------|-------------------|---------------------|-------------------------------|-----------|-----|-------------|
| AE 1      | 21-1-01653S38_C01 | Testbox             | Testbox programmable<br>(USB) | 180401C24 | N/A | RKE223_V7.0 |
| AE 2      | 21-1-01653S48_C01 | Car                 | Mercedes Benz (C236)          | --        | --  | --          |

\*) AE short description is used to simplify the identification of the auxiliary equipment in this test report. If the table above does not show any other line than the headline, no AE was used during testing nor was taken into account for evaluation

## 2.10 Connected cables (CAB)

| CAB No. *) | Sample No.        | Cable Type        | Connectors / Details                        | Length |
|------------|-------------------|-------------------|---------------------------------------------|--------|
| CAB 1      | 21-1-01653S43_C01 | Cable for Testbox | Cable harness Testbox to Application sample | 200 cm |

\*) CAB short description is used to simplify the identification of the connected cables in this test report. If the table above does not show any other line than the headline, no cable was used during testing nor was taken into account for evaluation

## 2.11 Software (SW)

| SW No. *) | Sample No. | SW Name | Description                  | SW Status |
|-----------|------------|---------|------------------------------|-----------|
| SW 1      | --         | HTerm   | Change Testbox power setting | 0.8.5     |

\*) SW short description is used to simplify the identification of the used software in this test report. If the table above does not show any other line than the headline, no SW was used during testing nor was taken into account for evaluation.

## 2.12 EUT set-ups

| set-up no. *) | Combination of EUT and AE           | Description                                                                  |
|---------------|-------------------------------------|------------------------------------------------------------------------------|
| Set. 1        | EUT 1 + AE 1 + AE 2 + CAB1 (+ SW 1) | Used for radiated measurements. SW 1 is just used to set testbox power level |

\*) EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

## 2.13 EUT operation modes

| EUT operating mode no. *) | Operating modes | Additional information                                                         |
|---------------------------|-----------------|--------------------------------------------------------------------------------|
| Op. 1                     | TX              | Continuous modulated transmission<br>Power value: 0x2D   Antenna 1   Channel 2 |

\*) EUT operating mode no. is used to simplify the test report.

### 3 Equipment under test (EUT)

#### 3.1 General Data of Main EUT as Declared by Applicant

|                                                                                  |                                             |                                                                        |                           |
|----------------------------------------------------------------------------------|---------------------------------------------|------------------------------------------------------------------------|---------------------------|
| Firmware                                                                         | <input type="checkbox"/> for normal use     | <input checked="" type="checkbox"/> Special version for test execution |                           |
| Power supply                                                                     | <input type="checkbox"/> AC Mains           | --                                                                     |                           |
|                                                                                  | <input type="checkbox"/> DC Mains           | --                                                                     |                           |
|                                                                                  | <input checked="" type="checkbox"/> Battery | Lead-Acid-Car battery via banana connector                             |                           |
| Operational conditions                                                           | T <sub>nom</sub> =21 °C                     | T <sub>min</sub> =-40 °C                                               | T <sub>max</sub> =+105 °C |
| EUT sample type                                                                  | Production                                  |                                                                        |                           |
| Weight                                                                           | 0.800 kg                                    |                                                                        |                           |
| Size [LxWxH]                                                                     | 65.0 cm x 11.0 cm x 3.5 cm                  |                                                                        |                           |
| Interfaces/Ports                                                                 | MQS-connector + 5x Fakra-connector          |                                                                        |                           |
| For further details refer Applicants Declaration & following technical documents |                                             |                                                                        |                           |
| 181106_RKE-Box_Manual.pdf                                                        |                                             |                                                                        |                           |
| Description_Testbox_programming_detail.pptx                                      |                                             |                                                                        |                           |
| SCN-Kodierung_MRA2_RKE223E1_J1.xlsx                                              |                                             |                                                                        |                           |

#### 3.2 Modifications on Test sample

|                                    |    |
|------------------------------------|----|
| Additions/deviations or exclusions | -- |
|------------------------------------|----|

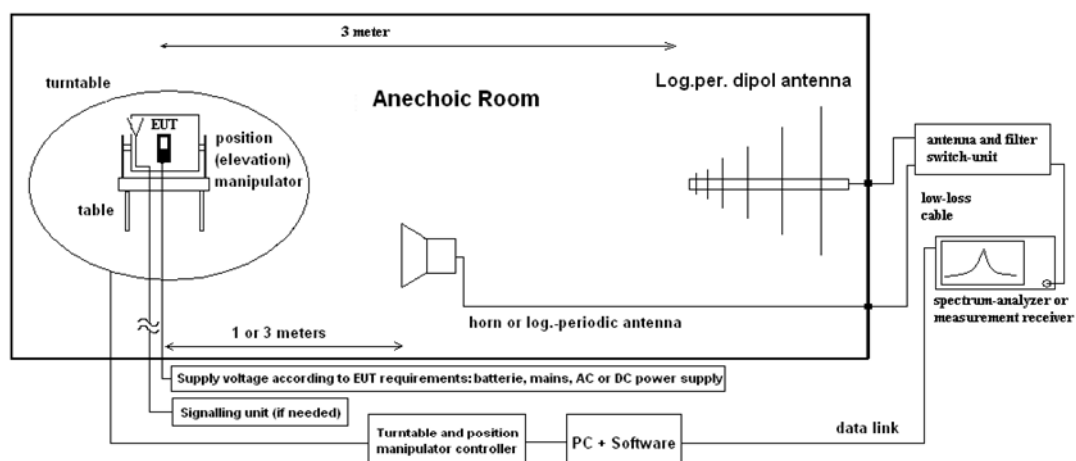
## 4 Measurements

### 4.1 Radiated field strength emissions 30 MHz – 1 GHz

#### 4.1.1 Description of the general test setup and methodology, see below example:

Evaluating the field emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a NSA-compliant semi anechoic room (SAR) recognized by the regulatory commissions.

##### Schematic:



##### Testing method:

The measurement is made according to relevant reference clauses:  
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

##### Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 0.8 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 90°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and its characteristics was recorded with an EMI-receiver, broadband antenna and software.

Measurement antenna: horizontal and vertical, heights: 1,0 m and 1,82 m as worst-case determined by an exploratory emission measurements. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

##### Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by main-taining the EUT's worst-case operation mode, cable position, etc. either on 10m OATS or 3m semi-anechoic room.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position). The measurement antenna height between 1 m and 4 m.

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out

#### Formula:

$$E_C = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_C \quad (2)$$

AF = Antenna factor

$C_L$  = Cable loss

$D_F$  = Distance correction factor (if used)

$E_C$  = Electrical field – corrected value

$E_R$  = Receiver reading

$G_A$  = Gain of pre-amplifier (if used)

$L_T$  = Limit

M = Margin

All units are dB-units, positive margin means value is below limit.

## 4.1.2 Measurement Location

|           |                                         |
|-----------|-----------------------------------------|
| Test site | 225911 - SAC5 - Radiated Emission <1GHz |
|-----------|-----------------------------------------|

## 4.1.3 Fundamental limits: FCC §15.231(b), RSS-210, Issue 10, Chapter A1.2

| Frequency Range [MHz]     | 3 meters reference measurement |                | Spurious settings |                 |
|---------------------------|--------------------------------|----------------|-------------------|-----------------|
|                           | Limit [μV/m]                   | Limit [dBμV/m] | Detector          | RBW / VBW [kHz] |
| 40.66-40.70<br>(Only USA) | 2250                           | 67.04          | QP-Peak or AV     | --/--           |
| 70-130                    | 1250                           | 61.93          |                   | --/--           |
| 130-174                   | 1250 to 3750                   | 61.93 to 71.48 |                   | --/--           |
| 174-260                   | 3750                           | 71.48          |                   | --/--           |
| 260-470                   | 3750 to 12500                  | 71.48 to 81.93 |                   | 1000 / 3000     |
| Above 470                 | 12500                          | 81.93          |                   | --/--           |
| Above 1000                | 12500                          | 81.93          |                   | --/--           |

## 4.1.4 Spurious emission limits: FCC §15.231(b), RSS-210, Issue 10, Chapter A1.2

| Frequency Range [MHz]     | 3 meters reference measurement |                | Spurious settings |                 |
|---------------------------|--------------------------------|----------------|-------------------|-----------------|
|                           | Limit [μV/m]                   | Limit [dBμV/m] | Detector          | RBW / VBW [kHz] |
| 40.66-40.70<br>(only USA) | 225                            | 47.04          | QP-Peak or AV     | 100 / 300       |
| 70-130                    | 125                            | 41.93          |                   | 100 / 300       |
| 130-174                   | 125 to 375                     | 41.93 to 51.48 |                   | 100 / 300       |
| 174-260                   | 375                            | 51.48          |                   | 100 / 300       |
| 260-470                   | 375 to 1250                    | 51.48 to 61.93 |                   | 100 / 300       |
| Above 470                 | 1250                           | 61.93          |                   | 100 / 300       |
| Above 1000                | 1250                           | 61.93          |                   | 1000 / 3000     |

#### 4.1.5 Results for field strength of carrier

| Diagram | Channel    | Channel frequency | Op. Mode / Set-up no. | Maximum Level [dBμV/m]@3m | Limit: [dBμV/m]@3m | Result |
|---------|------------|-------------------|-----------------------|---------------------------|--------------------|--------|
| --      | 1 - low    | 433.47 MHz        | Op. 1 / Set. 1        | 76.24 AV                  | 80.81 AV           | PASSED |
| --      | 3 - middle | 433.92 MHz        | Op. 1 / Set. 1        | 76.41 AV                  | 80.82 AV           | PASSED |
| --      | 2 - high   | 434.37 MHz        | Op. 1 / Set. 1        | 76.44 AV                  | 80.84 AV           | PASSED |

Remarks:

- 1.) For more information and graphical plot refer to Test Report CETECOM\_TR21-1-0163507T01a.
- 2.) power level setting: 0x2D, set on AE1
- 3.) RF-Path 1 used due higher power levels then RF Path 2 (pre-tested)
- 4.) Average value includes duty-cycle correction factor of -17.35 dB due timing of transmitter (modules certification)

#### 4.1.6 Results for spurious emissions

| Diagram | Channel | Mode/Set-up    | Frequency Range 600 – 1000 MHz [dBμV/m] | Result |
|---------|---------|----------------|-----------------------------------------|--------|
| 3.01    | 1       | Op. 1 / Set. 1 | 36.448 (PK) @ 996.76 MHz <sup>1)</sup>  | PASSED |

Remarks:

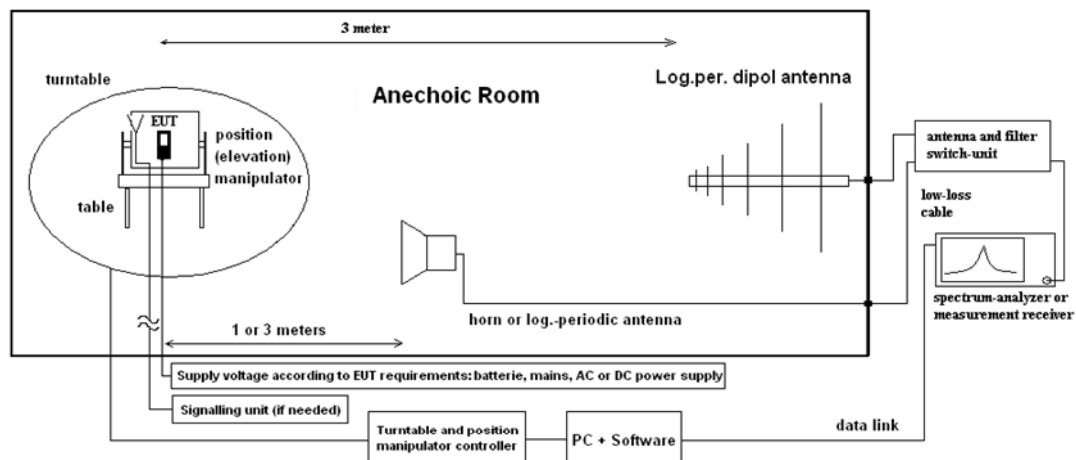
1. noise level
2. for more information and graphical plot see annex A1 **CETECOM\_TR21-1-0165307T03a\_A1**

## 4.2 Radiated field strength emissions above 1 GHz

### 4.2.1 Description of the general test setup and methodology, see below example:

Evaluating the emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a CISPR 18-1-4:2010 compliant fully anechoic room (FAR) recognized by the regulatory commission. The measurement distance was set to 3 meter for frequencies up to 18 GHz and 2 meter above 18 GHz. A logarithmic periodic antenna is used for the frequency range 30 MHz to 1 GHz. Horn antennas are used for frequency range 1 GHz to 40 GHz. The EUT is aligned within 3 dB beam width of the measurement antenna with three orthogonal axis measurements on the EUT.

#### Schematic:



#### Testing method:

The measurement is made according to relevant reference clauses:

(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

#### Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 1.55 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 15°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and its characteristics was recorded with an EMI-receiver, broadband antenna and software.

The measurements are performed in horizontal and vertical polarization of the measurement antennas. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

#### Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by main-taining the EUT's worst-case operation mode, cable position, etc.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself over 3-orthogonal axis and the height for EUT with large dimensions or three axis scan for portable/small equipment.

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

#### Formula:

$$E_C = E_R + A_F + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_C \quad (2)$$

$E_C$  = Electrical field – corrected value

$E_R$  = Receiver reading

$M$  = Margin

$L_T$  = Limit

$A_F$  = Antenna factor

$C_L$  = Cable loss

$D_F$  = Distance correction factor (if used)

$G_A$  = Gain of pre-amplifier (if used)

All units are dB-units, positive margin means value is below limit.

#### 4.2.2 Measurement Location

|           |                                         |
|-----------|-----------------------------------------|
| Test site | 225912 - SAC5 - Radiated Emission >1GHz |
|-----------|-----------------------------------------|

#### 4.2.3 Spurious emission limits: FCC §15.231(b), RSS-210, Issue 10, Chapter A1.2

| Frequency Range [MHz] | 3 meters reference measurement   |                                           | Spurious settings |                 |
|-----------------------|----------------------------------|-------------------------------------------|-------------------|-----------------|
|                       | Limit [ $\mu\text{V}/\text{m}$ ] | Limit [ $\text{dB}\mu\text{V}/\text{m}$ ] | Detector          | RBW / VBW [kHz] |
| Above 1000            | 1250                             | 61.93                                     | QP-Peak or AV     | 1000/ 3000      |

#### 4.2.4 Result

| Diagram | Channel | Mode/Set-up    | Maximum Level [ $\text{dB}\mu\text{V}/\text{m}$ ]<br>Frequency Range 1 – 2.7 GHz | Result |
|---------|---------|----------------|----------------------------------------------------------------------------------|--------|
| 4.01    | 1       | Op. 1 / Set. 1 | 52.620 (PK) @ 2.6527 GHz <sup>1)</sup><br>41.647 (AV) @ 2.6640 GHz <sup>1)</sup> | PASSED |

Remark:

1. noise level
2. for more information and graphical plot see annex A1 **CETECOM\_TR21-1-0165307T03a\_A1**

### 4.3 Equipment lists

| ID    | Description                                 | Manufacturer                                   | SerNo                  | CheckType | Last Check                           | Interval              | Next Check                           |
|-------|---------------------------------------------|------------------------------------------------|------------------------|-----------|--------------------------------------|-----------------------|--------------------------------------|
|       | 225911 - SAC5 - Radiated Emission <1GHz     |                                                |                        | calchk    | cal: 2016-Apr-05<br>chk: 2021-Jan-20 | cal: 120M<br>chk: 12M | cal: 2026-Apr-05<br>chk: 2022-Jan-20 |
| 25357 | Ultrabroadband Antenna HL562E               | Rohde & Schwarz Messgerätebau GmbH             | 100824                 | cal       | cal: 2020-Oct-09                     | cal: 36M              | cal: 2023-Oct-09                     |
|       | 225912 - SAC5 - Radiated Emission >1GHz     |                                                |                        | calchk    | cal: 2016-May-04<br>chk: 2021-May-19 | cal: 120M<br>chk: 12M | cal: 2026-May-04<br>chk: 2022-May-19 |
| 25316 | Multifunction AC/DC Power Source Netwave 20 | EM TEST GmbH / Kamen                           | V1227113059            | cal       | cal: 2021-May-20                     | cal: 36M              | cal: 2024-May-20                     |
| 25348 | Test Receiver ESR7                          | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 101600                 | cal       | cal: 2021-Aug-09                     | cal: 24M              | cal: 2023-Aug-09                     |
| 25352 | Open Switch and control Platform OSP120     | Rohde & Schwarz Messgerätebau GmbH             | 101542-rV              | cpu       |                                      |                       |                                      |
| 25358 | Semi Anechoic Chamber SAC5                  | Albatross Projects GmbH / Nattheim             | P27281-016             | cal       | cal: 2022-Aug-12                     | cal: 10Y              | cal: 2032-Aug-12                     |
| 25360 | Antenna Mast BAM 4.5-P                      | mature GmbH / Pfreimd                          | BAM 4.5-P/091/17791115 | cnn       | cal: -<br>chk: -                     | cal: -<br>chk: -      | cal: -<br>chk: -                     |
| 25361 | Controller NCD                              | mature GmbH                                    | NCD/202/17791115       | cnn       | cal: -<br>chk: -                     | cal: -<br>chk: -      | cal: -<br>chk: -                     |
| 25376 | Measurement Software EMC32 [SAC5]           | Rohde & Schwarz Messgerätebau GmbH             | v10.60.10              | cnn       | cal: -<br>chk: -                     | cal: -<br>chk: -      | cal: -<br>chk: -                     |

Tools used in 'P1M1'

#### 4.3.1 Legend

| Note / remarks | Interval of calibration & Verification |
|----------------|----------------------------------------|
| 12M            | 12 months                              |
| 24M            | 24 months                              |
| 36M            | 36 months                              |
| 10Y            | 10 Years                               |

| Abbreviation Check Type | Description                                |
|-------------------------|--------------------------------------------|
| cnn                     | Calibration and verification not necessary |
| cal                     | Calibration                                |
| calchk                  | Calibration plus intermediate Verification |
| chk                     | Verification                               |
| cpu                     | Verification before usage                  |

## 5 Results from external laboratory

|      |   |
|------|---|
| None | - |
|------|---|

## 6 Opinions and interpretations

|      |   |
|------|---|
| None | - |
|------|---|

## 7 List of abbreviations

|      |   |
|------|---|
| None | - |
|------|---|

## 8 Measurement Uncertainty valid for conducted/radiated measurements

The reported uncertainties are calculated based on the standard uncertainty multiplied with the appropriate coverage factor **k**, such that a confidence level of approximately 95% is achieved. For uncertainty determination, each component used in the concrete measurement set-up was taken in account and its contribution to the overall uncertainty according its statistical distribution calculated.

| Issue No. | Measurement type                                         | Reference                  | Frequency range of measurement |            | Calculated Uncertainty based on confidence level of 95.54% | Remarks                                                                        |
|-----------|----------------------------------------------------------|----------------------------|--------------------------------|------------|------------------------------------------------------------|--------------------------------------------------------------------------------|
|           |                                                          |                            | Start [MHz]                    | Stop [MHz] |                                                            |                                                                                |
| 1         | Magnetic field strength                                  | FCC15/18/22/24/27/90, ISED | 0.009                          | 30         | 4.86                                                       | Magnetic loop antenna, Pre-amp on                                              |
| 2         | RF-Output power (eirp)<br>Unwanted emissions (eirp) [dB] | FCC15/18 / ISED            | 30                             | 100        | 4.57                                                       | without Pre-Amp                                                                |
|           |                                                          |                            | 30                             | 100        | 4.91                                                       | with PreAmp                                                                    |
|           |                                                          |                            | 100                            | 1000       | 4.02                                                       | without Pre-Amp                                                                |
|           |                                                          |                            | 100                            | 1000       | 4.26                                                       | with PreAmp                                                                    |
|           |                                                          |                            | 1000                           | 18000      | 4.36                                                       | without Pre-Amp                                                                |
|           |                                                          |                            | 1000                           | 18000      | 5.23                                                       | with PreAmp                                                                    |
|           |                                                          |                            | 18000                          | 33000      | 4.92                                                       | Schwarzbeck BBHA9170 (#20302) Antenna set-up non-waveguide antenna)            |
|           |                                                          |                            | 33000                          | 50000      | 4.17                                                       | Set-up for Q-Band (WR-22), non-wave guide antenna                              |
|           |                                                          |                            | 40000                          | 60000      | 4.69                                                       | Set-up U-Band (WR-19), non-waveguide antenna                                   |
|           |                                                          |                            | 50000                          | 75000      | 4.06                                                       | External Mixer set-up V-Band (WR-15)                                           |
|           |                                                          |                            | 75000                          | 110000     | 4.17                                                       | External Mixer set-up W-Band (WR-6)                                            |
|           |                                                          |                            | 90000                          | 140000     | 5.49                                                       | External Mixer set-up F-Band (WR-8)                                            |
|           |                                                          |                            | 140000                         | 225000     | 6.22                                                       | External Mixer set-up G-Band (WR-5)                                            |
|           |                                                          |                            | 225000                         | 325000     | 7.04                                                       | External Mixer set-up (WR-3)                                                   |
|           |                                                          |                            | 325000                         | 500000     | 8.84                                                       | External Mixer set-up (WR-2.2)                                                 |
| 3         | Radiated Blocking [dB]                                   | EN303883                   | 1000                           | 18000      | 2.85                                                       | Typical set-up with microwave generator and antenna, value for 7GHz calculated |
|           |                                                          |                            | 18000                          | 33000      | 4.66                                                       | Typical set-up with microwave generator and antenna                            |
|           |                                                          |                            | 33000                          | 50000      | 3.48                                                       | WR-22 set-up                                                                   |
|           |                                                          |                            | 50000                          | 75000      | 3.73                                                       | WR-15 set-up                                                                   |
|           |                                                          |                            | 75000                          | 110000     | 4.26                                                       | WR-6 set-up                                                                    |
| 4         | Frequency Error / UWB+FCW [kHz]                          | EN303883<br>FCC 15         | 40000                          | 77000      | 276.19                                                     | calculated for 77 GHz (FCW) carrier                                            |
|           | Frequency Error / NFC [Hz]                               | FCC 15                     | 6000                           | 7000       | 33.92                                                      | calculated for 6.5GHz UWB Ch.5                                                 |
|           |                                                          |                            | 11.00                          | 14.00      | 20.76                                                      | calculated for 13.56MHz NFC carrier                                            |
| 5         | TS 8997<br>conducted Parameters                          | FCC15/18 / ISED            | 30                             | 6000       | 1.11                                                       | 1. Power measurement with Fast-sampling-detector                               |
|           |                                                          |                            | 30                             | 6000       | 1.20                                                       | 2. Power measurement with Spectrum-Analyzer                                    |
|           |                                                          |                            | 30                             | 6000       | 1.20                                                       | 3. Power Spectrum-Density measurement                                          |
|           |                                                          |                            | 30                             | 7500       | 1.20                                                       | 4. Conducted Spurious emissions:                                               |
|           |                                                          |                            | 0.009                          | 30         | 2.56                                                       | 5. Conducted Spurious emissions:                                               |
|           |                                                          |                            | 2.4                            | 2.48       | 1.95 ppm                                                   | 6a. Bandwidth / 2-Marker Method for 2.4GHz ISM                                 |
|           |                                                          |                            | 5.18                           | 5.825      | 7.180 ppm                                                  | 6b. Bandwidth / 2-Marker Method for 5GHz WLAN                                  |
|           |                                                          |                            | 5.18                           | 5.825      | 1.099 ppm                                                  | 7 Frequency (Marker method) for 5GHz WLAN                                      |
|           |                                                          |                            | 30                             | 6000       | 0.11561µs                                                  | 8 Medium-Utilization factor / Timing                                           |
|           |                                                          |                            | 30                             | 6000       | 1.85                                                       | 9 Blocking-Level of companion device                                           |
|           |                                                          |                            | 30                             | 6000       | 1.62                                                       | 9 Blocking Generator level                                                     |
|           |                                                          |                            |                                |            |                                                            |                                                                                |
|           |                                                          |                            |                                |            |                                                            |                                                                                |
|           |                                                          |                            |                                |            |                                                            |                                                                                |
| 6         | Conducted emissions                                      | EN303883<br>FCC 15         | 0.009                          | 30         | 3.57                                                       |                                                                                |

## 9 Versions of test reports (change history)

| Version | Applied changes | Date of release |
|---------|-----------------|-----------------|
| --      | Initial release | 2023-Jan-20     |
| --      | --              | --              |
| --      | --              | --              |

**End Of Test Report**