

# Report on the FCC and IC Testing of the Sirona Dental Systems GmbH Post Processing Unit „Primeprint PPU“ Model: 6745553 D3699 In accordance with FCC 47 CFR Part 15 C and ISED RSS-210 and ISED RSS-Gen

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## COMMERCIAL-IN-CONFIDENCE

Date: 2021-04-15

Document Number: TR-31247-12516-01 | Edition 1



Product Service

**Add value.  
Inspire trust.**

| RESPONSIBLE FOR      | NAME           | DATE       | SIGNATURE                               |
|----------------------|----------------|------------|-----------------------------------------|
| Project Management   | Martin Steindl | 2021-04-15 | <i>Steindl Martin</i><br>SIGN-ID 494391 |
| Authorised Signatory |                | 2021-04-19 | <i>Stump</i><br>SIGN-ID 495496          |

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

### Engineering Statement:

This measurement shown in this report were made in accordance with the procedures described on test pages.  
All reported testing was carried out on a sample equipment to demonstrate limited compliance with with FCC 47 CFR Part 15 C and ISED RSS-210 and RSS-GEN.  
The sample tested was found to comply with the requirements defined in the applied rules.

| RESPONSIBLE FOR | NAME           | DATE       | SIGNATURE                               |
|-----------------|----------------|------------|-----------------------------------------|
| Testing         | Martin Steindl | 2021-04-15 | <i>Steindl Martin</i><br>SIGN-ID 494395 |

Laboratory Accreditation      Laboratory recognition      Industry Canada test site registration  
DAkkS Reg. No. D-PL-11321-11-02      Registration No. BnetzA-CAB-16/21-15      3050A-2  
DAkkS Reg. No. D-PL-11321-11-03

### Executive Statement:

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15 C:2020 and ISED RSS-210:2019 and ISED RSS-Gen:2021

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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Trade Register Munich  
HRB 85742  
VAT ID No. DE129484267  
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# 1 Report Summary

## 1.1 Modification Report

Alterations and additions of this report will be issued to the holders of each copy in the form of a complete document.

| Issue | Description of changes | Date of Issue |
|-------|------------------------|---------------|
| 1     | First Issue            | 2021-04-15    |

Table 1: Report of Modifications

## 1.2 Introduction

|                                      |                                                                                                                                |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Applicant                            | Sirona Dental Systems GmbH                                                                                                     |
| Manufacturer                         | Sirona Dental Systems GmbH                                                                                                     |
| Brand                                | Dentsply Sirona                                                                                                                |
| Model Number(s)                      | 6745553 D3699                                                                                                                  |
| Serial Number(s)                     | 800112                                                                                                                         |
| Hardware Version(s)                  | N/A                                                                                                                            |
| Software Version(s)                  | N/A                                                                                                                            |
| FCC ID                               | 2AD7W-6745553                                                                                                                  |
| ISED                                 | 12730A-6745553                                                                                                                 |
| Number of Samples Tested             | 1                                                                                                                              |
| Test Specification(s) / Issue / Date | FCC 47 CFR Part 15 C : 2020 and<br>ISED RSS-210, Issue 10, Amd. 1 : 2020<br>ISED RSS-Gen, Issue 5, Amd. 1 : 2019, Amd. 2: 2021 |
| Test Plan/Issue/Date                 | NA                                                                                                                             |
| Order Number                         | N/A                                                                                                                            |
| Date                                 | 2021-03-26                                                                                                                     |
| Date of Receipt of EUT               | 2021-04-08                                                                                                                     |
| Start of Test                        | 2021-04-08                                                                                                                     |
| Finish of Test                       | 2021-04-12                                                                                                                     |
| Name of Engineer(s)                  | M. Steindl                                                                                                                     |
| Related Document(s)                  | ANSI C63.10:2013                                                                                                               |



### 1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15 C and ISED RSS-210 and RSS-Gen is shown below.

| Section | Specification Clause | Test Description                        | Result           |
|---------|----------------------|-----------------------------------------|------------------|
| ---     | 15.203               | Antenna requirement                     | Internal Antenna |
| 2.1     | 15.215(c)            | Bandwidth of Signal                     | Pass             |
| 2.2     | 15.207               | Conducted Disturbance at Mains Terminal | Pass             |
| 2.3     | 15.209, 15.225       | Radiated Disturbance                    | Pass             |
| 2.4     | 15.225(e)            | Frequency Tolerance                     | Pass             |

**Table 2: Results according to FCC 47 CFR Part 15 C**

| Section | Specification Clause | Test Description                  | Result |
|---------|----------------------|-----------------------------------|--------|
| 2.2     | 7.3                  | Radiated Emissions                | Pass   |
| 2.3     | 7.3                  | AC Power Line Conducted Emissions | Pass   |
| 2.4     | B.6 b.               | Frequency Tolerance               | Pass   |

**Table 3: Results according to ISED RSS-210**

| Section | Specification Clause | Test Description                  | Result |
|---------|----------------------|-----------------------------------|--------|
| 2.1     | 6.7                  | Bandwidth of Signal               | Pass   |
| 2.3     | 8.8                  | AC Power Line Conducted Emissions | Pass   |
| 2.2     | 8.9, 8.10            | Radiated Emissions                | Pass   |
| 2.4     | 6.11                 | Frequency Tolerance               | Pass   |

**Table 4: Results according to ISED RSS-Gen**



## 1.4 Product Information

### 1.4.1 Technical Description

#### 1.4.1.1 General Information

|                                                      |                         |
|------------------------------------------------------|-------------------------|
| <i>Frequency Band</i>                                | 13.110 MHz – 14.010 MHz |
| <i>Number of frequency channels:</i>                 | 1                       |
| <i>Emission designator:</i>                          | 10K0A1D                 |
| <i>Supply Voltage:</i>                               | 120 V                   |
| <i>Supply Frequency:</i>                             | 60 Hz                   |
| <i>Highest clock frequency<br/>(radio part):</i>     | 13.56 MHz               |
| <i>Highest clock frequency<br/>(non-radio part):</i> | 800 MHz                 |

#### 1.4.1.2 Intended use

The Primeprint PPU is designed to finalize three-dimensional dental applications made of plastic resins after the 3D printing process (washing, drying, light hardening). It is part of an overall system of computer aided imaging, design and manufacturing.

The product only covers the finalization process. For this purpose, objects are washed in two separate isopropanol baths in one operation, dried in the room air and finally cured in a light chamber.

The Primeprint PPU uses RFID technique to identify the transport box for the printed dental device and the two washing boxes.

The transport box delivers the information about the type of material and the volume of the printed dental device.

For the washing boxes the type of cleaning substance and the number of washing cycles is controlled by the RFID function

#### 1.4.1.3 RFID usage

Inside the Primeprint PPU there are three identical transponders. All are implemented on the detector board.

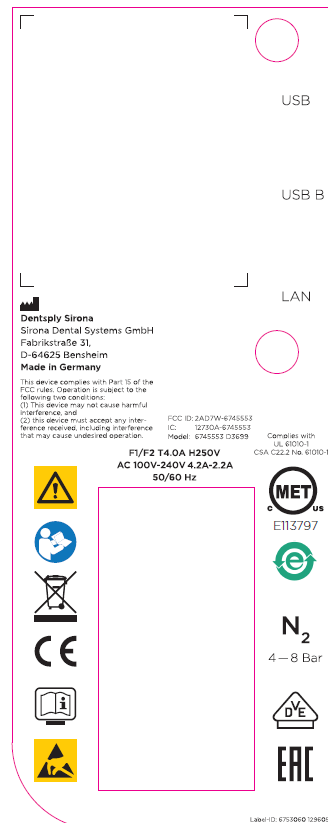
All transponders are using the same chip and are configured to a maximum of 200 mW transmitting power.

The antenna is a single layer antenna.



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#### 1.4.1.4 Marking Plate



#### 1.4.2 EUT Ports / Cables identification

| Port            | Type        | Screened |
|-----------------|-------------|----------|
| USB, Port A     | Digital I/O | Yes      |
| USB, Port B     | Digital I/O | Yes      |
| LAN             | Digital I/O | Yes      |
| AC power supply | AC supply   | No       |

Table 5



## 1.5 Test Configuration

The EUT was powered with 120 V at 60 Hz.

## 1.6 Modes of Operation

All three RFID units were active during tests.

## 1.7 EUT Modifications Record

The table below details modifications made to the EUT during the test programme.  
The modifications incorporated during each test are recorded on the appropriate test pages.

| Modification State | Description of Modification still fitted to EUT | Modification Fitted By | Date Modification Fitted |
|--------------------|-------------------------------------------------|------------------------|--------------------------|
| 0                  | As supplied by the customer                     | Not Applicable         | Not Applicable           |

Table 6

## 1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing test laboratory:

| Test Name                               | Name of Engineer(s) |
|-----------------------------------------|---------------------|
| Conducted Disturbance at Mains Terminal | M. Steindl          |
| Radiated Emissions                      | M. Steindl          |
| Temperature test                        | M. Steindl          |

### Office Address:

Äußere Frühlingstraße 45  
94315 Straubing  
Germany



## 2 Test Details

### 2.1 Bandwidth of Signal

#### 2.1.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.215(c)  
ISED RSS-Gen, Clause 6.7

#### 2.1.2 Equipment under Test and Modification State

6745553 D3699; S/N 800112; Modification State 0

#### 2.1.3 Date of Test

2021-09-04

#### 2.1.4 Environmental Conditions

|                     |       |
|---------------------|-------|
| Ambient Temperature | 20 °C |
| Relative Humidity   | 29 %  |

#### 2.1.5 Specification Limits

No limitation – Bandwidth noted

#### 2.1.6 Test Method

The test was performed according to ANSI C63.10, clauses 6.9  
See section 2.2 of this test report for details.





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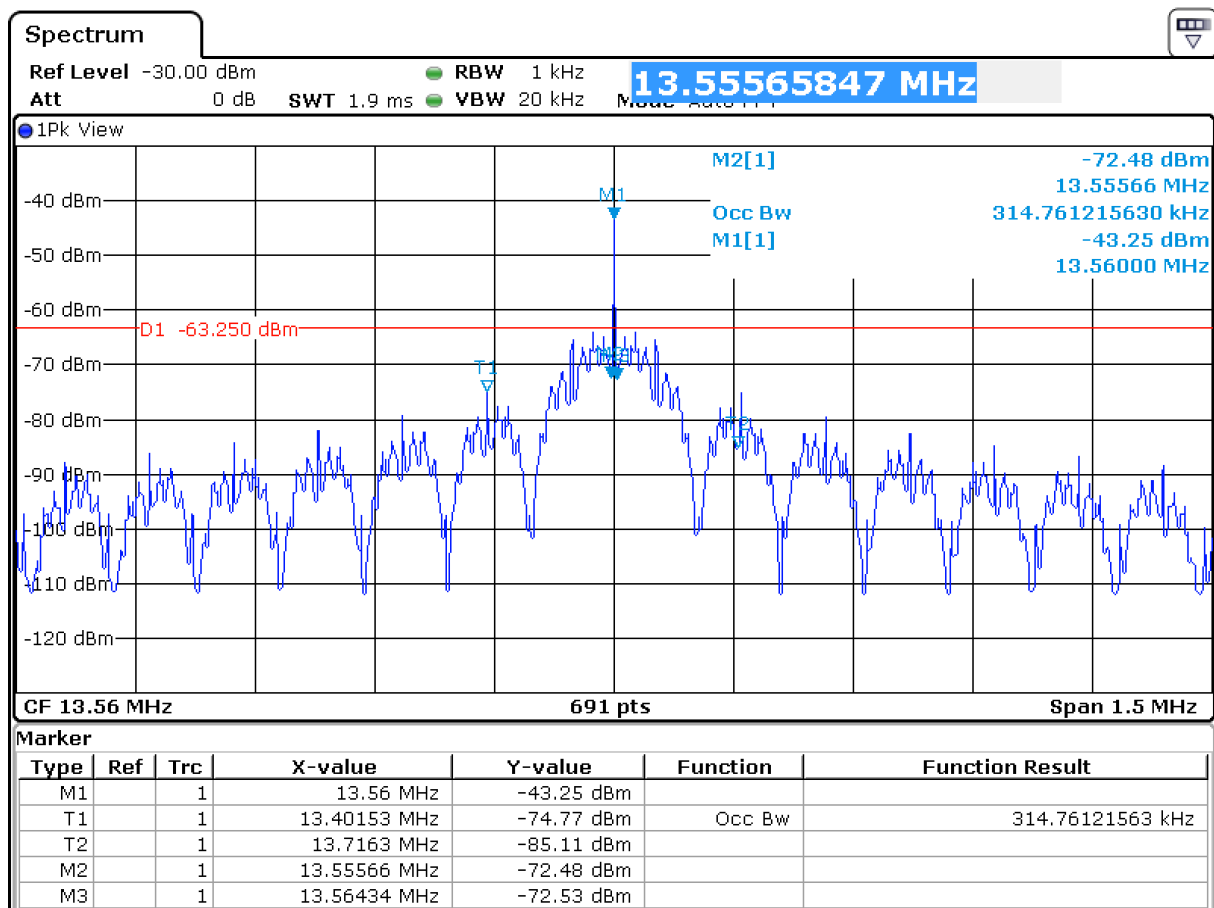
## 2.1.7 Test Results

| Center frequency | 20 dB Bandwidth (MHz) |
|------------------|-----------------------|
| 13.56 MHz        | 8.68 kHz              |

Table 7: 20 dB bandwidth

| Centre Frequency | 99% Bandwidth (MHz) |
|------------------|---------------------|
| 13.56 MHz        | 314.76 kHz          |

Table 8: 99% bandwidth



Date: 9.APR.2021 09:44:25



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## 2.1.8 Test Location and Test Equipment

The test was carried out in non shielded room

| Instrument          | Manufacturer    | Type No | TE No | Calibra-<br>tion Pe-<br>riod<br>(months) | Calibration Due |
|---------------------|-----------------|---------|-------|------------------------------------------|-----------------|
| Spectrum Analysator | Rohde & Schwarz | FSV 40  | 20219 | 24                                       | 2022-01-31      |

**Table 9**



Product Service

## **2.2 Radiated Emissions**

### **2.2.1 Specification Reference**

FCC 47 CFR Part 15 C, Clauses 15.205, 15.209 and 15.225  
ISED RSS-210, Clause 7.7 and B.6  
ISED RSS-Gen, Clauses 8.9 and 8.10

### **2.2.2 Equipment under Test and Modification State**

6745553 D3699; S/N 800112; Modification State 0

### **2.2.3 Date of Test**

2020-04-08

### **2.2.4 Environmental Conditions**

|                     |       |
|---------------------|-------|
| Ambient Temperature | 20 °C |
| Relative Humidity   | 29 %  |



## 2.2.5 Specification Limits

| Radiated emission limits: |                      |                     |                              |                     |                              |
|---------------------------|----------------------|---------------------|------------------------------|---------------------|------------------------------|
| Frequency Range<br>(MHz)  | Test distance<br>(m) | Field strength      |                              | Field strength      |                              |
|                           |                      | ( $\mu\text{A/m}$ ) | ( $\text{dB}\mu\text{A/m}$ ) | ( $\mu\text{V/m}$ ) | ( $\text{dB}\mu\text{V/m}$ ) |
| 0.009 – 0.49              | 300                  | $6.37 / f$          | $20*\lg(6.37 / f)$           | $2400 / f$          | $20*\lg(2400 / f)$           |
| 0.49 – 1.705              | 30                   | $63.7 / f$          | $20*\lg(63.7 / f)$           | $24000 / f$         | $20*\lg(24000 / f)$          |
| 1.705 – 13.110            | 30                   | 0.08                | -21.94                       | 30                  | 29.54                        |
| 13.110 – 13.410           | 30                   | 0.283               | -11.0                        | 106                 | 40.5                         |
| 13.410 – 13.553           | 30                   | 0.891               | -1.0                         | 334                 | 50.5                         |
| 13.553 – 13.567           | 30                   | 42.26               | 32.5                         | 15848               | 84                           |
| 13.567 – 13.710           | 30                   | 0.891               | -1.0                         | 334                 | 50.5                         |
| 13.710 – 14.010           | 30                   | 0.283               | -11.0                        | 106                 | 40.5                         |
| 14.010 - 30               | 30                   | 0.08                | -21.94                       | 30                  | 29.54                        |
| 30 – 88                   | 3                    | ---                 | ---                          | 100                 | 40                           |
| 88 – 216                  | 3                    | --                  | ---                          | 150                 | 43.5                         |
| 126 – 960                 | 3                    | --                  | ---                          | 200                 | 46                           |
| above 960                 | 3                    | --                  | ---                          | 500                 | 54                           |
| Note 1: $f$ in kHz        |                      |                     |                              |                     |                              |

Table 10 Radiated emission limits

## 2.2.6 Test Method

The test was performed according to ANSI C63.10, sections 11.11 and 11.12

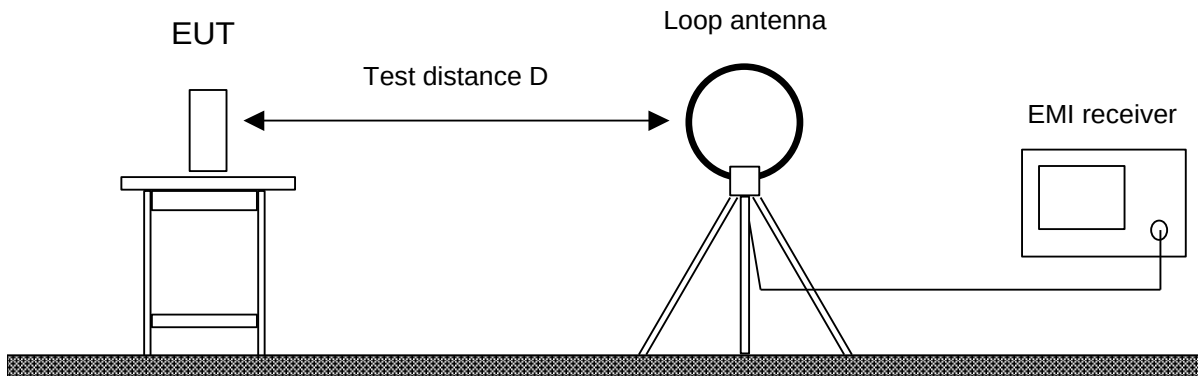
Prescans are performed in six positions of the EUT to get the full spectrum of emission caused by the EUT with the measuring antenna raised and lowered from 1 m to 4 m with vertical and horizontal polarisation to find the combination of table position, antenna height and antenna polarisation for the maximum emission levels.

Data reduction is applied to these results to select those levels having less margin than 10 dB or exceeding the limit using subranges and limited number of maximums.

Further maximisation for adjusting the maximum position is following.

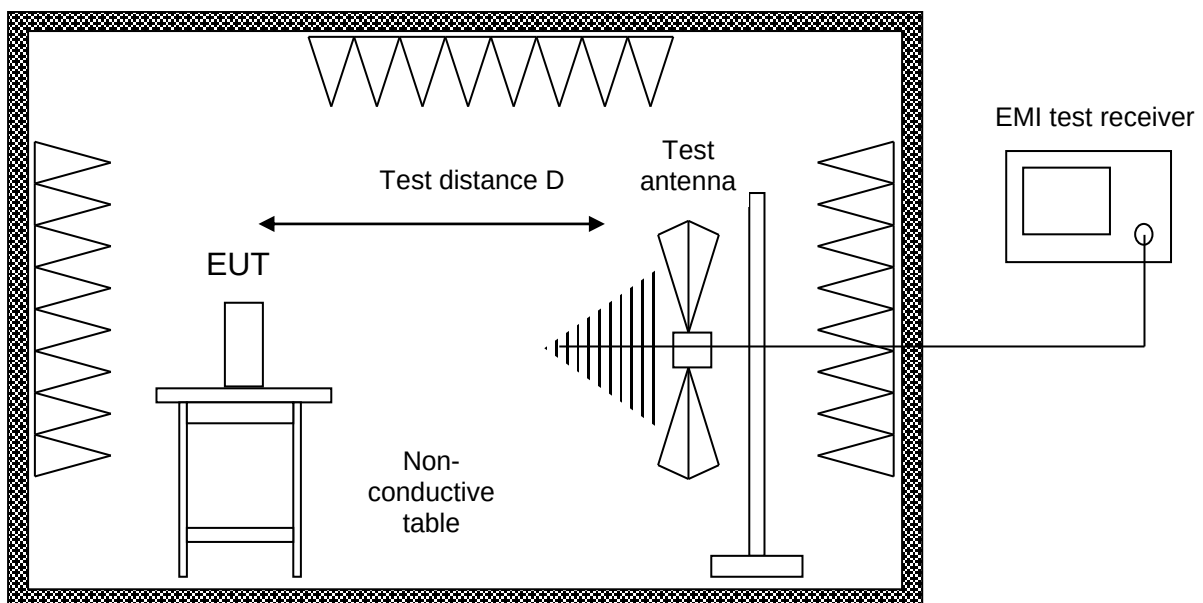
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

#### 2.2.6.1 Frequency range 9 kHz – 30 MHz



The EUT was placed on a non-conductive table, 0.8 m above the ground. Radiated emissions in the frequency 9 kHz – 30 MHz is measured within a semi-anechoic room with an active loop antenna with the measurement detector set to peak. In addition in the frequency range 9 kHz to 490 kHz also an average detector was used. The measurement bandwidth of the receiver was set to 300 Hz in the frequency range 9 kHz to 150 kHz and 10 kHz in the frequency range 150 kHz to 30 MHz. Prescans were performed in six positions of the EUT. For final measurements the detector was set to CISPR quasi-peak and in addition to CISPR average in the frequency range 9 kHz to 490 kHz with a resolution bandwidth 200 Hz in the frequency range 9 kHz to 150 kHz and 9 kHz in the frequency range 150 kHz to 30 MHz. Final tests were performed immediately after a final frequency and zoom (for drifting disturbances) and maximum adjustment.

#### 2.2.6.2 Frequency range 30 MHz – 1 GHz



Alternate test site (semi anechoic room)

The EUT was placed on a non-conductive table, 0.8 m above the ground plane. Radiated emissions in the frequency range 30 MHz – 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4. for alternative test sites. A



linear polarised logarithmic periodic antenna combined with a 4:1 broadband dipole (“Trilog broadband antenna”) is used.

For prescan tests the test receiver is set to peak-detector with a bandwidth of 120 kHz.

With the measurement bandwidth of the test receiver set to 120 kHz CISPR quasi-peak detector is selected for final measurements following immediately after a final frequency zoom (for drifting disturbances) and maximum adjustment.

## 2.2.7 Test Results

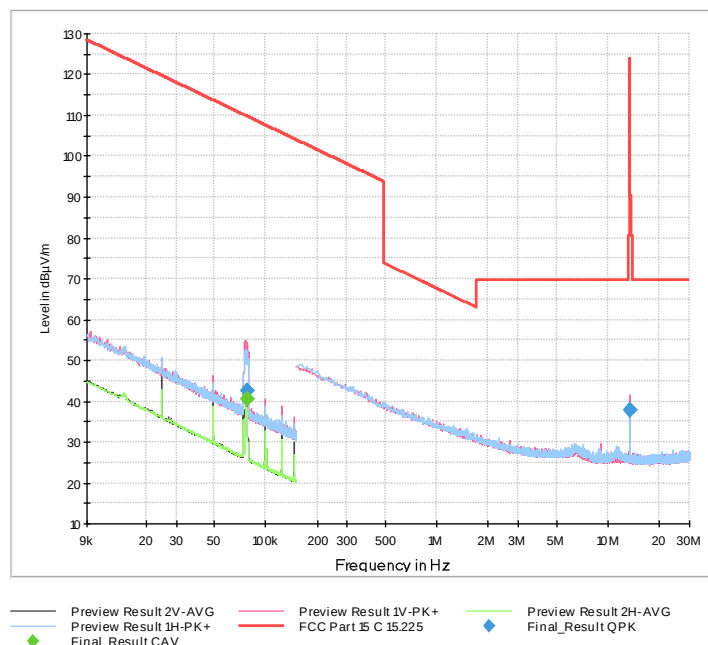
| Frequency range | Limit applied     | Test distance |
|-----------------|-------------------|---------------|
| 9 kHz – 30 MHz  | §§ 15.209, 15.225 | 3 m           |
| 30 MHz – 1 GHz  | § 15.209          | 3 m           |

Table 11

### Sample calculation:

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + (\text{Cable attenuation (dB)} + \text{Antenna Transducer (dB(1/m)))}$$

### Frequency range 9 kHz – 30 MHz:

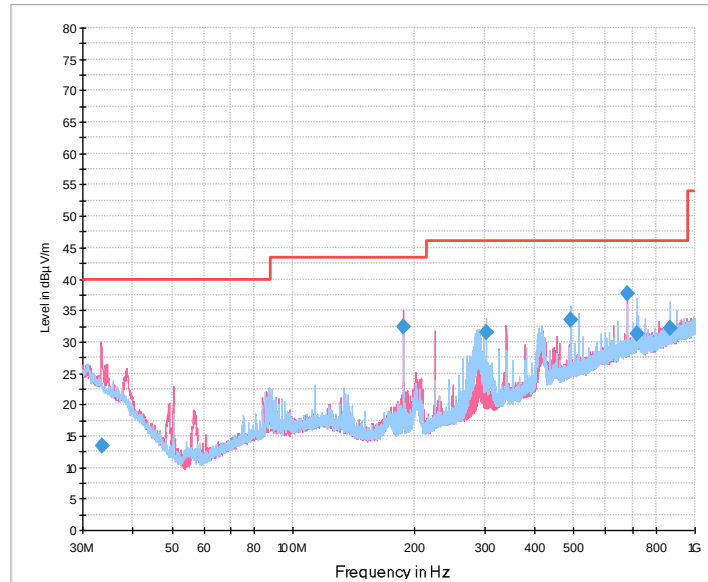


| Frequency<br>MHz | QuasiPeak<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB | Meas.<br>Time<br>ms | Band-<br>width<br>kHz | Height<br>cm | Pol | Azi-<br>muth<br>deg | Corr.<br>dB/m |
|------------------|---------------------|-----------------|--------------|---------------------|-----------------------|--------------|-----|---------------------|---------------|
| 0.078150         | 42.70               | 109.74          | 67.04        | 1000.0              | 0.200                 | 100.0        | V   | -138.0              | 19.3          |
| 13.560000        | 37.78               | 124.00          | 86.22        | 1000.0              | 9.000                 | 100.0        | V   | 60.0                | 18.9          |



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# Frequency range 30 MHz – 1 GHz:



Preview Result 1V-PK+  
 FCC Part 15C Electric Field Strength 3m QP

Preview Result 1H-PK+  
 Final\_Result QPK

| Frequency<br>MHz | Qua-<br>siPeak<br>dBµV/m | Limit<br>dBµV/m | Mar-<br>gin<br>dB | Meas.<br>Time<br>ms | Band-<br>width<br>kHz | Height<br>cm | Pol | Azi-<br>muth<br>deg | Corr.<br>dB/m |
|------------------|--------------------------|-----------------|-------------------|---------------------|-----------------------|--------------|-----|---------------------|---------------|
| 33.480000        | 13.36                    | 40.00           | 26.64             | 1000.0              | 120.000               | 107.0        | V   | -67.0               | 22.9          |
| 188.550000       | 32.45                    | 43.50           | 11.05             | 1000.0              | 120.000               | 198.0        | V   | -28.0               | 15.2          |
| 301.710000       | 31.57                    | 46.02           | 14.45             | 1000.0              | 120.000               | 104.0        | H   | 147.0               | 19.5          |
| 490.260000       | 33.57                    | 46.02           | 12.45             | 1000.0              | 120.000               | 214.0        | H   | 180.0               | 24.7          |
| 678.840000       | 37.66                    | 46.02           | 8.36              | 1000.0              | 120.000               | 111.0        | V   | 168.0               | 27.6          |
| 716.520000       | 31.31                    | 46.02           | 14.71             | 1000.0              | 120.000               | 201.0        | H   | 186.0               | 28.3          |
| 867.390000       | 32.20                    | 46.02           | 13.82             | 1000.0              | 120.000               | 199.0        | H   | 177.0               | 30.1          |



## 2.2.8 Test Location and Test Equipment

The test was carried out in Semi Anechoic Room, No. 11

| Instrument         | Manufacturer         | Type No      | TE No | Calibration Period (months) | Calibration Due |
|--------------------|----------------------|--------------|-------|-----------------------------|-----------------|
| EMI test receiver  | Rohde & Schwarz      | ESR7         | 22643 | 36                          | 2022-10         |
| ULTRALOG antenna   | Rohde & Schwarz      | HL562E       | 39969 | 36                          | 2022-11         |
| Fixed attenuator   | Aeroflex / Weinschel | 6 dB         | 39632 | 36                          | 2022-11         |
| Loop antenna       | Schwarzbeck          | FMZB 1519 B  | 44334 | 36                          | 2023-01         |
| Semi anechoic room | Fankonia             | Cabin No. 11 | 42961 | ---                         |                 |

**Table 12**





## 2.3 Conducted Emissions on Mains Terminals

### 2.3.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.207  
ISED RSS-Gen, Clause 8.8

### 2.3.2 Equipment under Test and Modification State

6745553 D3699; S/N 800112; Modification State 0

### 2.3.3 Date of Test

2020-04-09

### 2.3.4 Environmental Conditions

Ambient Temperature 20 °C  
Relative Humidity 29 %

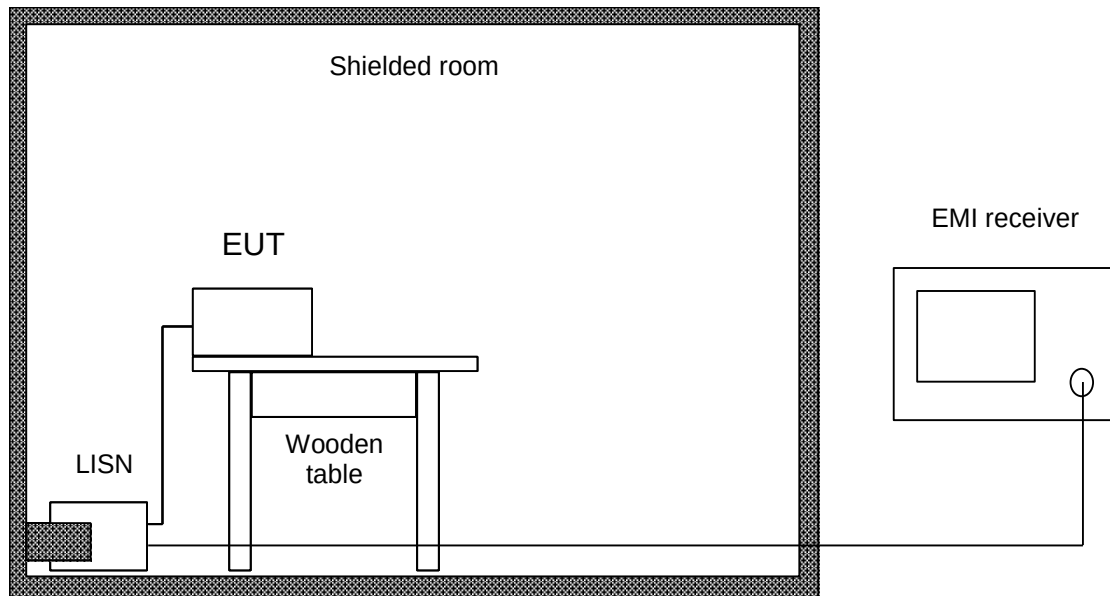
### 2.3.5 Specification Limits

| Required Specification Limits                                              |                       |                   |                |
|----------------------------------------------------------------------------|-----------------------|-------------------|----------------|
| Line Under Test                                                            | Frequency Range (MHz) | Quasi-peak (dBμV) | Average (dBμV) |
| AC Power Port                                                              | 0.15 to 0.5           | 66 to 56*         | 56 to 46*      |
|                                                                            | 0.5 to 5              | 56                | 46             |
|                                                                            | 5 to 30               | 60                | 50             |
| Supplementary information: *Decreases with the logarithm of the frequency. |                       |                   |                |

Table 13 Emission limits

### 2.3.6 Test Method

The test was performed according to ANSI C63.10, section 6.2.



The EUT was placed on a non-conductive table 0.8 m above a reference ground plane and 0.4 m away from a vertical coupling plane

All power was connected to the EUT through an Line Impedance Stabilization Network (LISN). Conducted disturbance voltage measurements on mains lines were made at the output of the LISN. The LISN was placed 0.8 m from the boundary of the EUT and bounded to the reference ground plane. To simplify testing with quasi-peak and linear average (cisp-average) detector the following procedure is used:

First the whole spectrum of emission caused by the equipment under test (EUT) is recorded with the detectors set to peak and average using CISPR bandwidth of 10 kHz. After that all emission levels having less margin than 10 dB to or exceeding the average limit are retested with the detectors set to quasi-peak and average. If the average limit is kept with quasi-peak levels measurement with average detector is optional. In cases of emission levels between quasi-peak and average limit an additional measurement with average detector has to be performed.

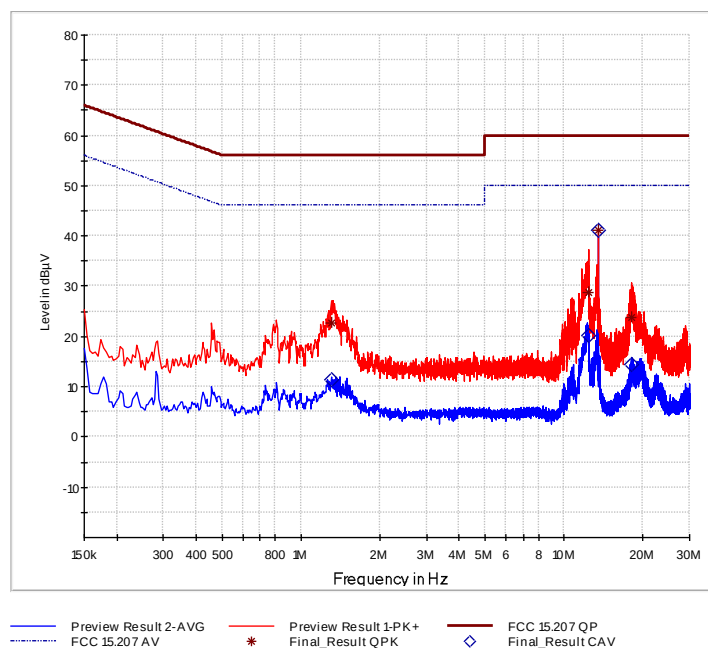


## 2.3.7 Test Results

### Sample calculation:

$$\text{Final Value (dB}\mu\text{V)} = \text{Reading Value (dB}\mu\text{V)} + (\text{Cable attenuation (dB)} + \text{LISN Transducer (dB)})$$

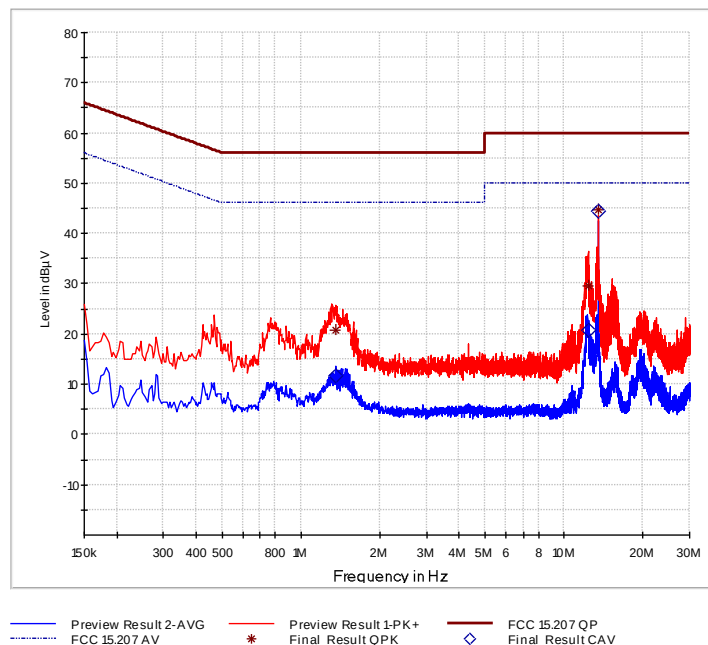
### AC Line, Phase N:



| Frequency<br>MHz | QuasiPeak<br>dBμV | CAverage<br>dBμV | Limit<br>dBμV | Margin<br>dB | Meas.<br>Time<br>ms | Band-<br>width<br>kHz | Corr.<br>dB |
|------------------|-------------------|------------------|---------------|--------------|---------------------|-----------------------|-------------|
| 1.302000         |                   | 11.53            | 46.00         | 34.47        | 1000.0              | 9.000                 | 10.1        |
| 1.302000         | 22.59             |                  | 56.00         | 33.41        | 1000.0              | 9.000                 | 10.1        |
| 12.354000        |                   | 20.24            | 50.00         | 29.76        | 1000.0              | 9.000                 | 10.2        |
| 12.354000        | 28.68             |                  | 60.00         | 31.32        | 1000.0              | 9.000                 | 10.2        |
| 13.562000        |                   | 41.27            | 50.00         | 8.73         | 1000.0              | 9.000                 | 10.2        |
| 13.562000        | 41.22             |                  | 60.00         | 18.78        | 1000.0              | 9.000                 | 10.2        |
| 18.126000        |                   | 14.46            | 50.00         | 35.54        | 1000.0              | 9.000                 | 10.3        |
| 18.126000        | 23.90             |                  | 60.00         | 36.10        | 1000.0              | 9.000                 | 10.3        |



## AC Line, Phase N:



| Frequency<br>MHz | Qua-<br>siPeak<br>dBµV | CAver-<br>age<br>dBµV | Limit<br>dBµV | Mar-<br>gin<br>dB | Meas.<br>Time<br>ms | Band-<br>width<br>kHz | Line | Fil-<br>ter | Corr.<br>dB |
|------------------|------------------------|-----------------------|---------------|-------------------|---------------------|-----------------------|------|-------------|-------------|
| 1.362000         |                        | 11.64                 | 46.00         | 34.36             | 1000.0              | 9.000                 | N    | OFF         | 10.1        |
| 1.362000         | 20.73                  |                       | 56.00         | 35.27             | 1000.0              | 9.000                 | N    | OFF         | 10.1        |
| 12.334000        |                        | 20.83                 | 50.00         | 29.17             | 1000.0              | 9.000                 | N    | OFF         | 10.2        |
| 12.334000        | 29.50                  |                       | 60.00         | 30.50             | 1000.0              | 9.000                 | N    | OFF         | 10.2        |
| 13.560001        |                        | 44.47                 | 50.00         | 5.53              | 1000.0              | 9.000                 | N    | OFF         | 10.2        |
| 13.560001        | 44.68                  |                       | 60.00         | 15.32             | 1000.0              | 9.000                 | N    | OFF         | 10.2        |

## 2.3.8 Test Location and Test Equipment

The test was carried out in Shielded Room, No. 4

| Instrument        | Manufacturer    | Type No | TE No | Calibra-<br>tion Pe-<br>riod<br>(months) | Calibration Due |
|-------------------|-----------------|---------|-------|------------------------------------------|-----------------|
| EMI test receiver | Rohde & Schwarz | ESCI    | 19730 | 24                                       | 2022-05         |
| V-Network         | Rohde & Schwarz | ENV26   | 39909 | 12                                       | 2022-02         |
| Shielded Room     | Euroshield      | No. 4   | 19314 | ---                                      |                 |

Table 14



## **2.4 Temperature Stability**

### **2.4.1 Specification Reference**

FCC 47 CFR Part 15 E, Clause 15.225(e)  
ISSED RSS-210, Clause B.6 b.  
ISED RSS-Gen, Clause 6.11

### **2.4.2 Equipment under Test and Modification State**

6745553 D3699; S/N 800112; Modification State 0

### **2.4.3 Date of Test**

2020-09-12

### **2.4.4 Environmental Conditions**

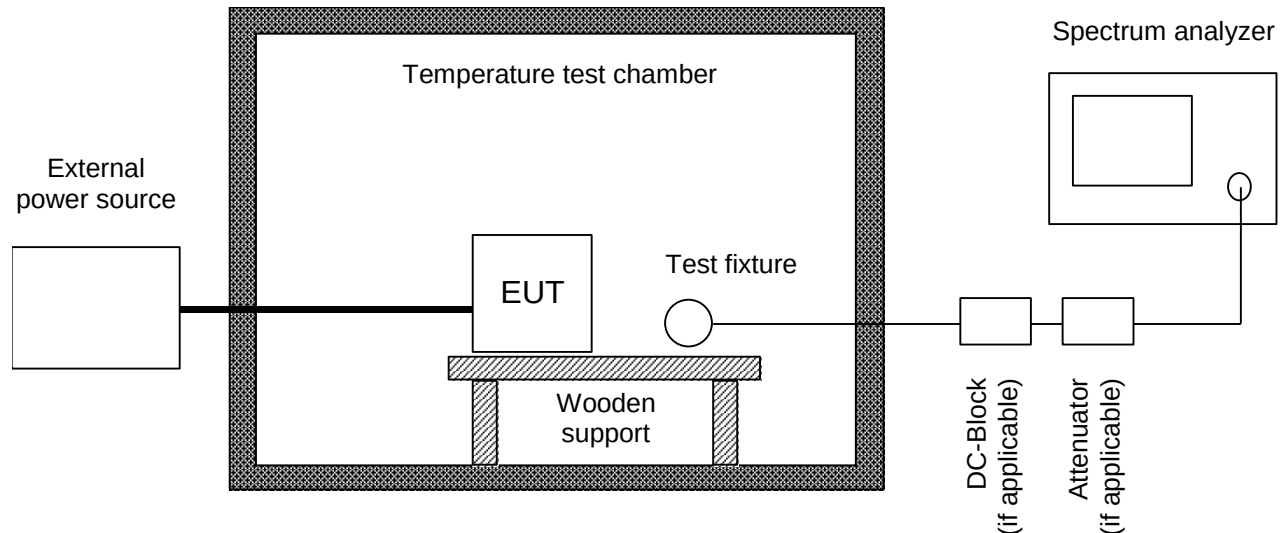
|                     |       |
|---------------------|-------|
| Ambient Temperature | 26 °C |
| Relative Humidity   | 27 %  |

### **2.4.5 Specification Limits**

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01$  % of the operating frequency over a temperature variation of -20 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 °C. For battery operated equipment, the equipment tests shall be performed using a new battery.

## 2.4.6 Test Method

The test was performed according to ANSI C63.10, section 6.8.



The frequency tolerance of the carrier signal is measured over a temperature variation of  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of  $20^{\circ}\text{C}$ . Temperature and voltage range may vary if the manufacturer states another temperature or voltage range.

If the EUT provides an antenna connector the spectrum analyzer is connected to this port. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as a DC block and appropriate (50  $\Omega$ ) attenuators. In case where the EUT does not provide an antenna connector or a test fixture is used.

For battery operated equipment, the test is performed using a new battery. Alternatively, an external supply voltage can be used and is at least set to:

- The maximum battery voltage as delivered by a new battery or 115 % of the battery nominal voltage;
- The battery nominal voltage
- 85 % of the battery nominal voltage
- The battery operating end point voltage which shall be specified by the equipment manufacturer.

The EUT is operating providing an unmodulated carrier for frequency error tests. The peak detector of the spectrum analyzer is selected and resolution as well as video bandwidth are set to values appropriate to shape of the spectrum of the EUT. The frequency counter mode of the spectrum analyzer is used to maximize the accuracy of the measured frequency tolerance.

If an unmodulated carrier is not available a significant and stable point of the spectrum is selected and the span is reduced to a value that delivers an accuracy which shall be better than 1 % of the maximum frequency tolerance allowed for the carrier signal. This method may be performed as long as the margin to the frequency tolerance is larger than the uncertainty of the measured frequency tolerance.



## 2.4.7 Test Results

| <i>Temperature</i> | <i>Supply Voltage</i> | <i>Frequency</i> | <i>Frequency drift</i> |
|--------------------|-----------------------|------------------|------------------------|
| -20 °C             | 120 V                 | 13.560041 MHz    | 3.10 ppm               |
| -10 °C             | 120 V                 | 13.560054 MHz    | 4.06 ppm               |
| 0 °C               | 120 V                 | 13.560049 MHz    | 3.69 ppm               |
| 10 °C              | 120 V                 | 13.560031 MHz    | 2.36 ppm               |
| 20 °C              | 102 V                 | 13.559999 MHz    | 0.00 ppm               |
| 20 °C              | 120 V                 | 13.559999 MHz    | 0.00 ppm               |
| 20 °C              | 138 V                 | 13.559999 MHz    | 0.00 ppm               |
| 30 °C              | 120 V                 | 13.559966 MHz    | -2.43 ppm              |
| 40 °C              | 120 V                 | 13.559943 MHz    | -4.13 ppm              |
| 50 °C              | 120 V                 | 13.559922 MHz    | -5.68 ppm              |

Table 15

## 2.4.8 Test Location and Test Equipment

The test was carried out in non-shielded test laboratory

| Instrument                      | Manufacturer    | Type No    | TE No | Calibra-<br>tion Pe-<br>riod<br>(months) | Calibration Due |
|---------------------------------|-----------------|------------|-------|------------------------------------------|-----------------|
| Climatic test chamber           | Espec           | ARS-1100-5 | 40116 | 12                                       | 2022-07         |
| Network and spectrum analysator | Rohde & Schwarz | ZVL6       | 19894 | 36                                       | 2023-06         |

Table 16



## 2.5 RF Exposure

### 2.5.1 Specification Reference

FCC 47 CFR Part 2 J, Clause 2.1093  
KDB 447498 D01 V06, section 4.3.1  
ISED RSS-Gen, Clause 3.4  
ISED RSS-102, Clause

### 2.5.2 Equipment under Test and Modification State

6745553 D3699; S/N 800112; Modification State 0

### 2.5.3 Date of Test

2021-04-15

### 2.5.4 Test Method

Estimation is based on output power test.  
For details please refer to section 2.2 of this test report.

### 2.5.5 Specification Limits

#### FCC 47 CFR Part 15 C, Clause 15.247(i)

Systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy levels in excess of the Commission's guideline.

Acc. to KDB 477498:

The 1 g and 10 g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separations distances  $\leq 50$  mm are determined by:

$$\frac{\text{max. power of channel, incl. tune - up tol., mW}}{\text{min. test separation distance, mm}} \cdot \sqrt{f, \text{GHz}} \leq \begin{cases} 3.0 & \text{for 1 g} \\ 7.5 & \text{for 10 g} \end{cases} \text{ extremity SAR}$$

1.  $f$  (GHz) is the RF channel frequency in GHz;
2. Power and distance are rounded to the nearest mW and mm before calculation;
3. The result is rounded to one decimal place for comparison;
4. 3.0 and 7.5 are referred to as the numeric thresholds

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied.

#### ISED RSS-102, Clause 2.5.1

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device





operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in the table.

For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in the table, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.:

| Frequency (MHz)   | Exemption limits (mW) <sup>1</sup> at separation distance of |       |       |       |       |       |       |       |       |        |
|-------------------|--------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
|                   | ≤5 mm                                                        | 10 mm | 15 mm | 20 mm | 25 mm | 30 mm | 35 mm | 40 mm | 45 mm | ≥50 mm |
| ≤300 <sup>2</sup> | 71                                                           | 101   | 132   | 162   | 193   | 223   | 254   | 284   | 315   | 345    |
| 450               | 52                                                           | 70    | 88    | 106   | 123   | 141   | 159   | 177   | 195   | 213    |
| 835               | 17                                                           | 30    | 42    | 55    | 67    | 80    | 92    | 105   | 117   | 130    |
| 1900              | 7                                                            | 10    | 18    | 34    | 60    | 99    | 153   | 225   | 316   | 431    |
| 2450              | 4                                                            | 7     | 15    | 30    | 52    | 83    | 123   | 173   | 235   | 309    |
| 3500              | 2                                                            | 6     | 16    | 32    | 55    | 86    | 124   | 170   | 225   | 290    |
| 5800              | 1                                                            | 6     | 15    | 27    | 41    | 56    | 71    | 85    | 97    | 106    |

<sup>1</sup> The exemption limit in the table are based on measurements and simulations on half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.

<sup>2</sup> Transmitters operating between 3 kHz and 10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in IC RSS-102, issue 5, section 4.



## 2.5.6 Test Results

Maximum EIRP =  $(E d)^2/30$ :

Frequency: 13.56 MHz  
Fielstrength 37.78 dB $\mu$ V/m = 77.446  $\mu$ V/m  
Test distance: 3 m  
Calclulaed EIPR: 1.799 nW

### KDB 447498 D01:

Maximum output power: 1.8 nW  
Minimum test separation distance: 5 mm  
Frequency: 13.56 MHz  
Limit (1 g SAR): 3.0  
Limit (10 g SAR): 7.5  
Test Result: Pass

Calculation according to section 4.3.1:

1.  $\frac{1}{2} \left[ 1 + \log \left( \frac{100}{100} \right) \right] * \left[ \left( \text{Power allowed at numeric threshold for 50 mm in step a} \right) + (50\text{mm} - 50\text{mm}) * \left( \frac{100}{150} \right) \right]$
2.  $\frac{1}{2} [1 + 0] * \left[ \left( \text{Power allowed at numeric threshold for 50 mm in step a} \right) + 0 * \left( \frac{100}{150} \right) \right]$
3.  $\frac{1}{2} [\text{Power allowed at numeric threshold for 50 mm in step a}]$
4.  $\frac{\text{max power}}{\text{min distance}} * \sqrt{f} \leq 3.0$
5.  $\text{max power} \leq \frac{3.0 * \text{min distance}}{\sqrt{f}}$
6.  $\text{max power} \leq \frac{3.0 * 50 \text{ mm}}{\sqrt{0.1 \text{ GHz}}} = 474 \text{ mW}$
7.  $\frac{1}{2} * 474 \text{ mW} = 237 \text{ mW} \rightarrow \text{maximal allowed Power}$
8.  $18 \text{ nW} < 237 \text{ mW} \rightarrow \text{criteria fulfilled}$

### ISED RSS-Gen, Clause 3.4

Frequency: 13.56 MHz  
Test distance: 3 m  
Carrier Power (e.i.r.p.): 1.799 nW  
Exemption limit: 71 mW  
Test Result: Pass



### 3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

The measurement uncertainty in the laboratory is less than or equal to the maximum measurement uncertainty according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 ( $U_{\text{CISPR}}$ ). This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.

| <i>Radio Interference Emission Testing</i>                                                                                                                                                                           |           |                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------|
| <i>Test Name</i>                                                                                                                                                                                                     | <i>kp</i> | <i>Expanded Uncertainty</i> |
| Conducted Voltage Emission                                                                                                                                                                                           |           |                             |
| 9 kHz to 150 kHz (50Ω/50μH AMN)                                                                                                                                                                                      | 2         | ± 3.8 dB                    |
| 150 kHz to 30 MHz (50Ω/50μH AMN)                                                                                                                                                                                     | 2         | ± 3.4 dB                    |
| 100 kHz to 200 MHz (50Ω/5μH AMN)                                                                                                                                                                                     | 2         | ± 3.6 dB                    |
| Discontinuous Conducted Emission                                                                                                                                                                                     |           |                             |
| 9 kHz to 150 kHz (50Ω/50μH AMN)                                                                                                                                                                                      | 2         | ± 3.8 dB                    |
| 150 kHz to 30 MHz (50Ω/50μH AMN)                                                                                                                                                                                     | 2         | ± 3.4 dB                    |
| Conducted Current Emission                                                                                                                                                                                           |           |                             |
| 9 kHz to 200 MHz                                                                                                                                                                                                     | 2         | ± 3.5 dB                    |
| Magnetic Fieldstrength                                                                                                                                                                                               |           |                             |
| 9 kHz to 30 MHz (with loop antenna)                                                                                                                                                                                  | 2         | ± 3.9 dB                    |
| 9 kHz to 30 MHz (large-loop antenna 2 m)                                                                                                                                                                             | 2         | ± 3.5 dB                    |
| Radiated Emission                                                                                                                                                                                                    |           |                             |
| 30 MHz to 300 MHz                                                                                                                                                                                                    | 2         | ± 4.9 dB                    |
| 300 MHz to 1 GHz                                                                                                                                                                                                     | 2         | ± 5.0 dB                    |
| 1 GHz to 6 GHz                                                                                                                                                                                                       | 2         | ± 4.6 dB                    |
| Test distance 10 m                                                                                                                                                                                                   |           |                             |
| 30 MHz to 300 MHz                                                                                                                                                                                                    | 2         | ± 4.9 dB                    |
| 300 MHz to 1 GHz                                                                                                                                                                                                     | 2         | ± 4.9 dB                    |
| The expanded uncertainty reported according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$ , providing a level of confidence of $p = 95.45\%$ |           |                             |

**Table 17 Measurement uncertainty based on CISPR 16-4-2**



| <i>Radio Interference Emission Testing</i>                                                                                                                                                         |           |                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------|
| <i>Test Name</i>                                                                                                                                                                                   | <i>kp</i> | <i>Expanded Uncertainty</i> |
| Occupied Bandwidth                                                                                                                                                                                 | 2         | ± 5 %                       |
| Conducted Power                                                                                                                                                                                    |           |                             |
| 9 kHz ≤ f < 30 MHz                                                                                                                                                                                 | 2         | ± 1.0 dB                    |
| 30 MHz ≤ f < 1 GHz                                                                                                                                                                                 | 2         | ± 1.5 dB                    |
| 1 GHz ≤ f ≤ 40 GHz                                                                                                                                                                                 | 2         | ± 2.5 dB                    |
| 1 MS/s power sensor (TS8997)                                                                                                                                                                       | 2         | ± 1.5 dB                    |
| Occupied Bandwidth                                                                                                                                                                                 | 2         | ± 5 %                       |
| Power Spectral Density                                                                                                                                                                             | 2         | ± 3.0 dB                    |
| Radiated Power                                                                                                                                                                                     |           |                             |
| 9 kHz ≤ f < 26.5 GHz                                                                                                                                                                               | 2         | ± 6.5 dB                    |
| 26.5 GHz ≤ f < 60 GHz                                                                                                                                                                              | 2         | ± 8.0 dB                    |
| 60 GHz ≤ f < 325 GHz                                                                                                                                                                               | 2         | ± 10 dB                     |
| Conducted Spurious Emissions                                                                                                                                                                       | 2         | ± 3.0 dB                    |
| Radiated Spurious Emissions                                                                                                                                                                        | 2         | ± 6.0 dB                    |
| Voltage                                                                                                                                                                                            |           |                             |
| DC                                                                                                                                                                                                 | 2         | ± 1.0 %                     |
| AC                                                                                                                                                                                                 | 2         | ± 2.0 %                     |
| Time (automatic)                                                                                                                                                                                   | 2         | ± 5 %                       |
| Frequency                                                                                                                                                                                          | 2         | ± 10 <sup>-7</sup>          |
| The expanded uncertainty reported according to to ETSI TR 100 028:2001 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45% |           |                             |

**Table 18 Measurement uncertainty based on ETSI TR 100 028**