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

Product Service

Add value.
Inspire trust.

Prepared for: Sirona Dental Systems GmbH
Fabrikstraße 31
64625 Bensheim
Germany

COMMERCIAL-IN-CONFIDENCE

Date: 2021-04-15
Document Number: TR-31247-12516-01 | Edition 1

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Martin Steindl	2021-04-15	Steindl Martin SIGN-ID 494391
Authorised Signatory		2021-04-19	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 reporded testing was carried out on a sample equipment to demonstrate limited compilance 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	Steindl Martin SIGN-ID 494395

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

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

Bundesnetzagentur
BNetzA-CAB-16/21-15

DISCLAIMER AND COPYRIGHT
This non-binding report has been prepared by TÜV SÜD Product Service with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD Product Service. No part of this document may be reproduced without the prior written approval of TÜV SÜD Product Service. © 2021 TÜV SÜD Product Service.

ACCREDITATION
Our BnetzA Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our BnetzA Accreditation.
Results of tests not covered by our BnetzA Accreditation Schedule are marked NBA (Not BnetzA Accredited).

Trade Register Munich
HRB 85742
VAT ID No. DE129484267
Information pursuant to Section 2(1) DL-InfoV (Germany) at www.tuev-sued.com/imprint

Managing Directors:
Walter Reithmaier (Sprecher / CEO)
Dr. Jens Butenandt
Patrick van Welij

Phone: +49 (0) 9421 55 22-0
Fax: +49 (0) 9421 55 22-99
www.tuev-sued.de

TÜV SÜD Product Service GmbH
Äußere Frühlingstraße 45
94315 Straubing
Germany

Product Service

Table of Content

Product Service

1 Report Summary

1.1 Modification Report

Alternations 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 ISED RSS-210, Issue 10, Amd. 1 : 2020 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

Product Service

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

Product Service

1.4 Product Information

1.4.1 Technical Description

1.4.1.1 General Information

Frequency Band	13.110 MHz – 14.010 MHz
Number of frequency channels:	1
Emission designator:	10K0A1D
Supply Voltage:	120 V
Supply Frequency:	60 Hz
Highest clock frequency (radio part):	13.56 MHz
Highest clock frequency (non-radio part):	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.

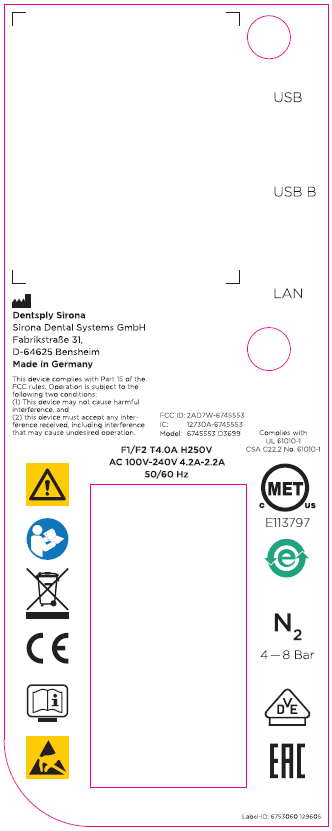
The Primeprint PPU uses RFID technique to identify the transport box for the printed dental device and the two washing boxes.
The transport box delivers the information about the type of material and the volume of the printed dental device.
For the washing boxes the type of cleaning substance and the 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 configurated to a maximum of 200 mW transmitting power.
The antenna is a single layer antenna.

Product Service

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

Product Service

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.

Product Service

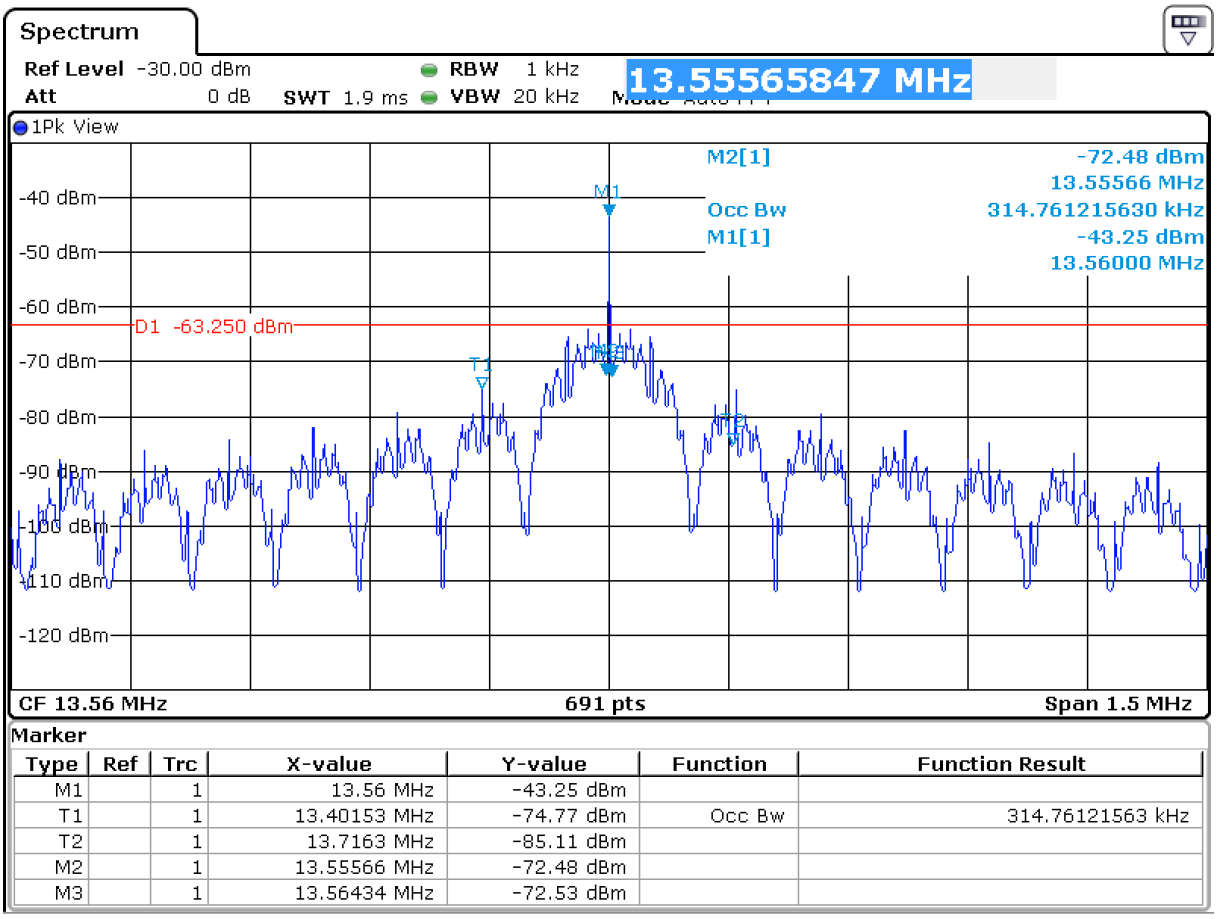
2.1.7 Test Results

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



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	13.56 MHz	-43.25 dBm		
T1		1	13.40153 MHz	-74.77 dBm	Occ Bw	314.76121563 kHz
T2		1	13.7163 MHz	-85.11 dBm		
M2		1	13.55566 MHz	-72.48 dBm		
M3		1	13.56434 MHz	-72.53 dBm		

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

Product Service

2.1.8 Test Location and Test Equipment

The test was carried out in non shielded room

Instrument	Manufacturer	Type No	TE No	Calibration Period (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 %

Product Service

2.2.5 Specification Limits

Radiated emission limits:					
Frequency Range	*Test distance*	*Field strength*		*Field strength*	
(MHz)	*(m)*	*(µA/m)*	*(dBµA/m)*	*(µV/m)*	*(dBµV/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

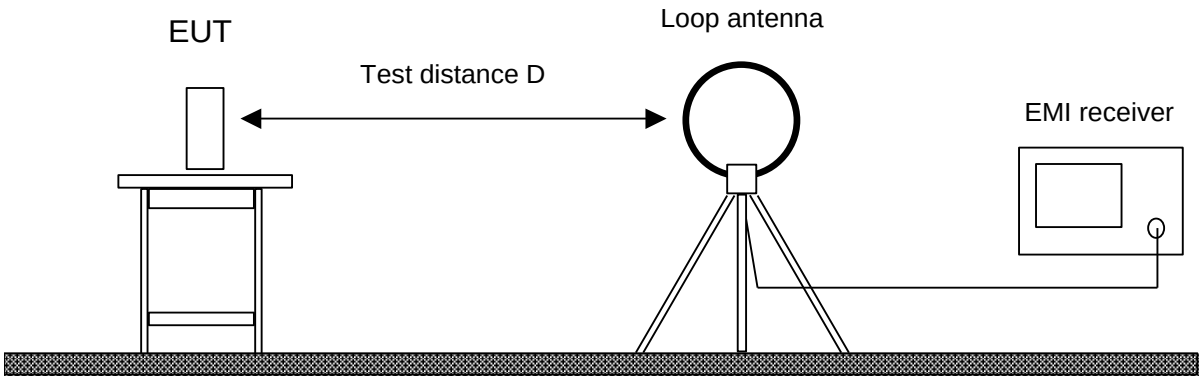
2.2.6 Test Method

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.

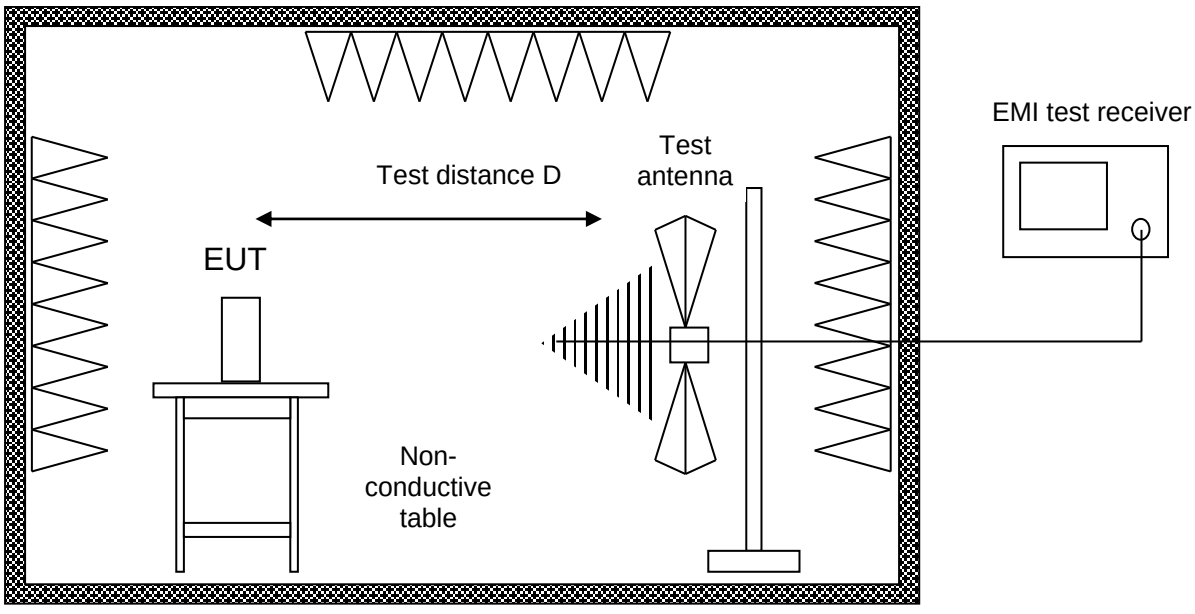
Product Service

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

Product Service

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

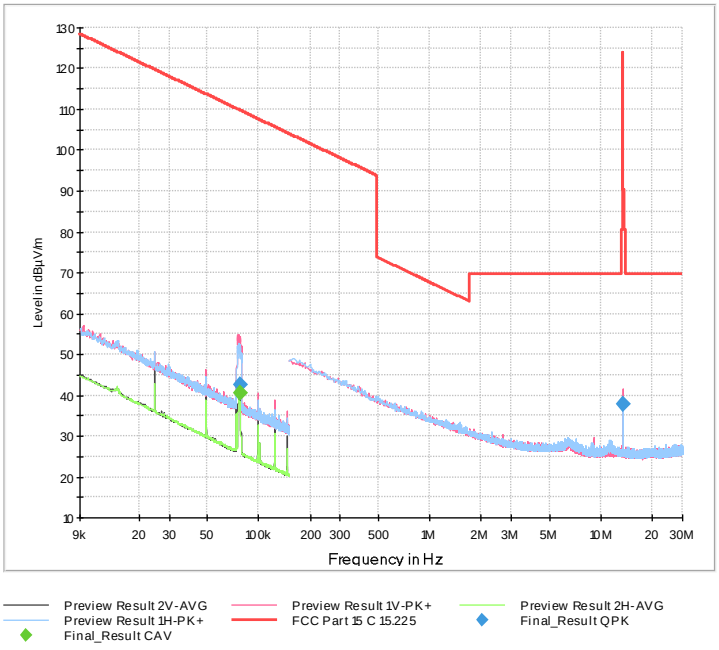
Frequency range	*Limit applied*	*Test distance*
9 kHz – 30 MHz	§§ 15.209, 15.225	3 m
30 MHz – 1 GHz	§ 15.209	3 m

Table 11

Sample calculation:

Final Value (dBµV/m) = Reading Value (dBµV) + (Cable attenuation (dB) + Antenna Transducer (dB(1/m)))

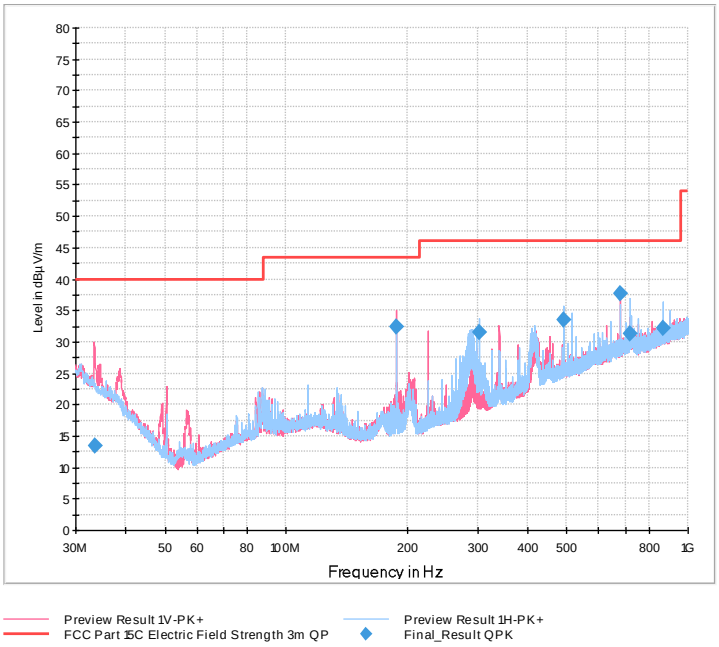
Frequency range 9 kHz – 30 MHz:



Frequency MHz	*Quasi-Peak dBµV/m*	*Limit dBµV/m*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Height cm*	*Pol*	*Azimuth deg*	*Corr. 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

Product Service

Frequency range 30 MHz – 1 GHz:



Frequency MHz	*Qua-siPeak dBµV/m*	*Limit dBµV/m*	*Mar-gin dB*	*Meas. Time ms*	*Band-width kHz*	*Height cm*	*Pol*	*Azi-muth deg*	*Corr. 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

Product Service

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

Product Service

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

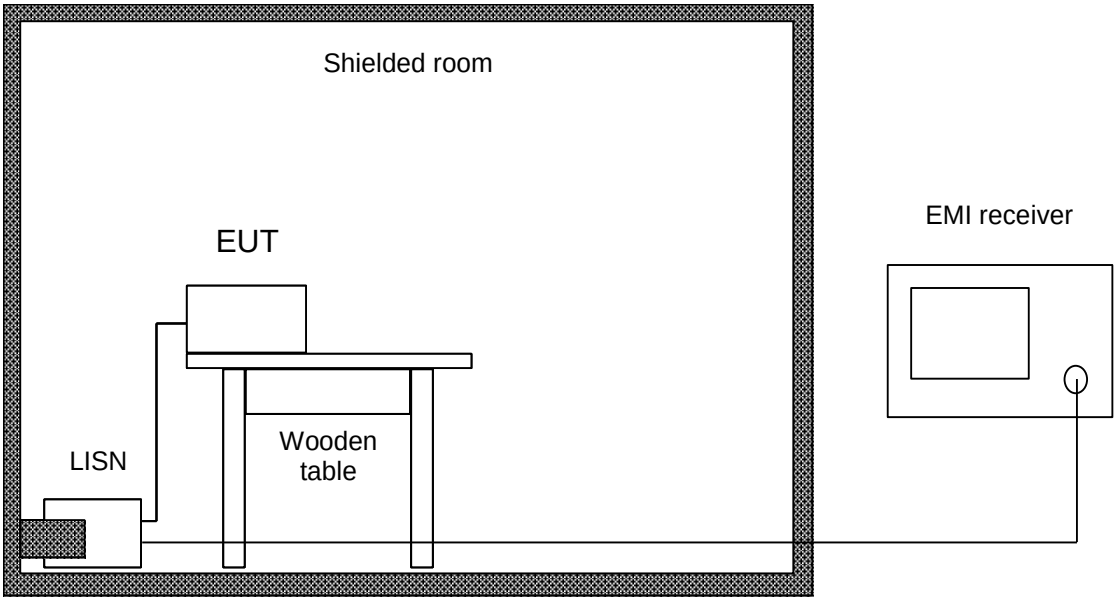
Required Specification Limits			
Line Under Test	*Frequency Range (MHz)*	*Quasi-peak (dBµV)*	*Average (dBµV)*
AC Power Port	0.15 to 0.5	66 to 56*	56 to 46*
	0.5 to 5	56	46
	5 to 30	60	50
Supplementary information: *Decreases with the logarithm of the frequency.			

Table 13 Emission limits

Product Service

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 (cispr-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.

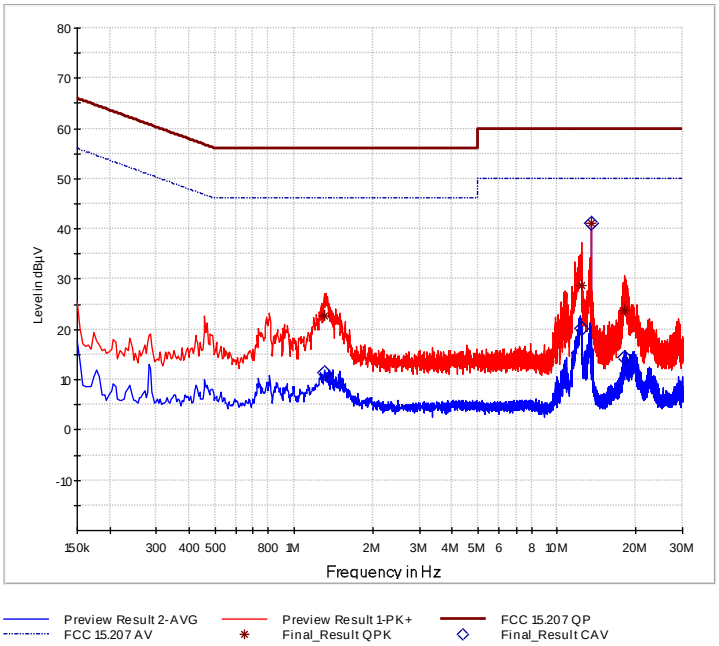
Product Service

2.3.7 Test Results

Sample calculation:

Final Value (dBµV) = Reading Value (dBµV) + (Cable attenuation (dB) + LISN Transducer (dB))

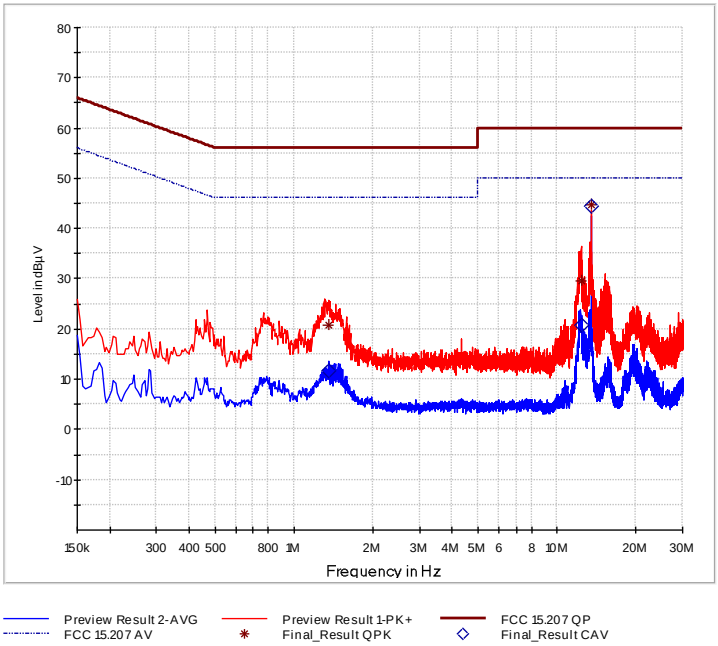
AC Line, Phase N:



Frequency MHz	*QuasiPeak dBµV*	*CAverage dBµV*	*Limit dBµV*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Corr. 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

Product Service

AC Line, Phase N:



Frequency MHz	*Qua-siPeak dBµV*	*CAver-age dBµV*	*Limit dBµV*	*Mar-gin dB*	*Meas. Time ms*	*Band-width kHz*	*Line*	*Fil-ter*	*Corr. 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-tion Pe-riod (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

Product Service

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 %

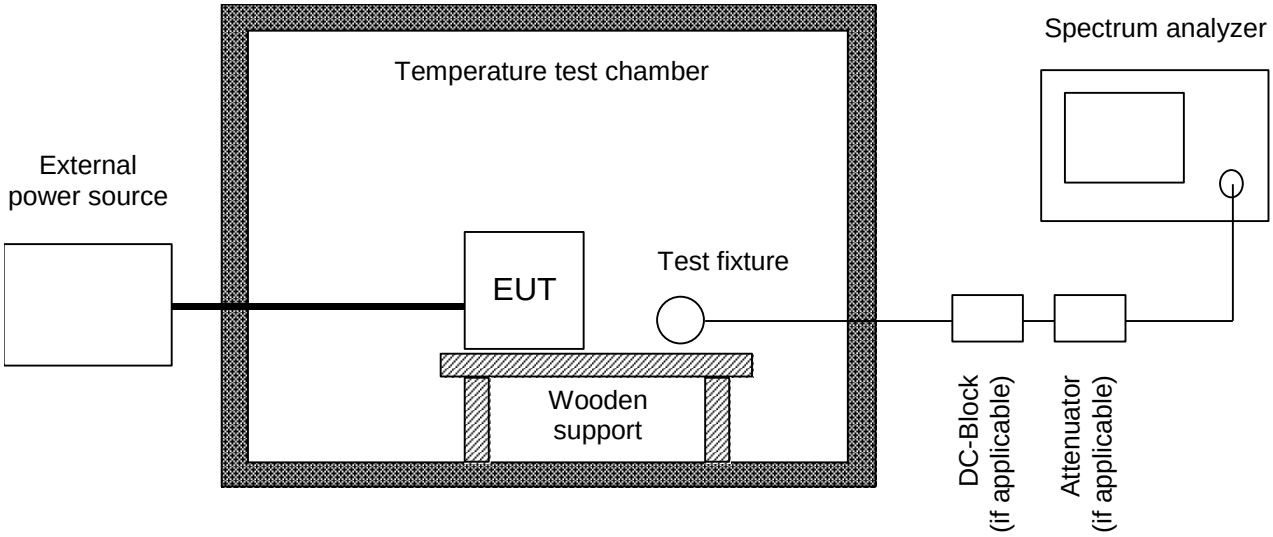
2.4.5 Specification Limits

The frequency tolerance of the carrier signal shall be maintained within ±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.

Product Service

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 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rates supply voltage at a temperature of 20 °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 Ω) 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.

Product Service

2.4.7 Test Results

Temperature	*Supply Voltage*	*Frequency*	*Frequency drift*
-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	Calibration Period (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

Product Service

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 Comission'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 ≤ 50 mm are determined by:

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

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 ≤ 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

Product Service

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)[1] 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 [2]	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

[1] The excemption limit in the table are based on measurements and simulations on half-wave dipole antennas at separaton 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 alinear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.
[2] 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.

Product Service

2.5.6 Test Results

Maximum EIRP = (E d)²/30:

Frequency:	13.56 MHz
Fielstrength	37.78 dBµV/m = 77.446 µV/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. $\frac{1}{2}\left[1+\log\left(\frac{100}{100}\right)\right]*\left[\left((Power\ allowed\ at\ numeric\ threshold\ for\ 50\ mm\ in\ step\ a)\right)+(50mm-50mm)*\left(\frac{100}{150}\right)\right]$
2. $\frac{1}{2}[1+0]*\left[\left((Power\ allowed\ at\ numeric\ threshold\ for\ 50\ mm\ in\ step\ a)\right)+0*\left(\frac{100}{150}\right)\right]$
3. $\frac{1}{2}[Power\ allowed\ at\ numeric\ threshold\ for\ 50\ mm\ in\ step\ a]$
4. $\frac{\max power}{\min distance}*\sqrt{f}\leq 3.0$
5. $\max power\leq\frac{3.0*\min distance}{\sqrt{f}}$
6. $\max power\leq\frac{3.0*50\ mm}{\sqrt{0{,}1GHz}}=474\ mW$
7. $\frac{1}{2}*474\ mW=237\ mW$ → maximal allowed Power
8. 18 nW < 237 mW → 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
Excemption limit:	71 mW
Test Result:	Pass

Product Service

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_{CISPR}). This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.

Radio Interference Emission Testing		
Test Name	*kp*	*Expanded Uncertainty*
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 to CISPR16-4-2: 2011 + A1 + A2 + Cor1 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

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

Radio Interference Emission Testing		
Test Name	*kp*	*Expanded Uncertainty*
Occupied Bandwdith	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^{-7}
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