

## Test Report 20-1-008041T02a

<b>Number of pages:</b>	18	<b>Date of Report:</b>	2020-Sep-09
<b>Testing company:</b>	CETECOM GmbH Im Teelbruch 116 45219 Essen Germany Tel. + 49 (0) 20 54 / 95 19-0 Fax: + 49 (0) 20 54 / 95 19-150	<b>Applicant:</b>	STRAFFR GMBH
<b>Test Object / Tested Device(s):</b>	smart resistance band <b>STRAFFR Band ST01X</b>		
<b>Listing FCC ID:</b>	2AWRM-ST01X	<b>Contains IC ID:</b>	23763-RSL10SIP
<b>Testing has been carried out in accordance with:</b>	<b>FCC Regulations:</b> Title 47 CFR, Chapter I FCC Regulations, Subchapter A Subpart B: §15.107, §15.109 (Class B limits)  <b>ISED Regulations:</b> ICES-003, Issue 6 (2016+Update 2019)  Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".		
<b>Tested Technology:</b>	None		
<b>Test Results:</b>	<input checked="" type="checkbox"/> <b>The EUT complies with the requirements in respect of all parameters subject to the test.</b> The test results relate only to devices specified in this document		
<b>Signatures:</b>	<div></div> <div>Ninovic Perez Responsible for test section</div> <div>Wolfgang Markus 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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The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at CETECOM.

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.

### 1.1. Summary of Test Results

Test case	Reference in FCC ☒	Reference in ISED ☒	Reference in RSS-GEN ☒	Remark	Result
<a href="#">AC-Power Lines Conducted Emissions</a>	§15.107	ICES-003, Issue 6	RSS Gen, Issue 5, Chapter 8.8	--	PASSED
<a href="#">Radiated field strength emissions 30 MHz – 1 GHz</a>	§15.109 §15.33 §15.35	ICES-003, Issue 6	RSS-Gen., Issue 5 Chapter 8.9, Chapter 7.3	--	PASSED
<a href="#">Radiated field strength emissions above 1 GHz</a>	§15.109 §15.33 §15.35	ICES-003, Issue 6	RSS-Gen., Issue 5 Chapter 8.9, Chapter 7.3	--	PASSED

PASSED

The EUT complies with the essential requirements in the standard.

FAILED

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

NP

The test was not performed by the CETECOM Laboratory.

### 1.2. Summary of Test Methods

Test case	Test method
AC-Power Lines Conducted Emissions	ANSI C63.4-2014 chapter 7
Radiated field strength emissions 30 MHz – 1 GHz	ANSI C63.4-2014 chapter 8.2.3
Radiated field strength emissions above 1 GHz	ANSI C63.4-2014 chapter 8.3

## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory

Company name:	CETECOM GmbH
Address:	Im Teelbruch 116 45219 Essen - Kettwig Germany
Responsible for testing laboratory:	Ninovic Perez
Accreditation scope:	<a href="#">DAkkS Webpage</a>
Test location:	CETECOM GmbH; Im Teelbruch 116 ;45219 Essen - Kettwig

### 2.2 General limits for environmental conditions

Temperature:	22±2 °C
Relative. humidity:	25±15% rH
Barometric Pressure:	1019 hPa

### 2.3 Test Laboratories sub-contracted

Company name:
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### 2.4 Organizational Items

Order No.:	1
Responsible test manager:	Wolfgang Markus
Receipt of EUT:	2020-Jul-15
Date(s) of test:	2020-Aug-04 – 2020-Aug-06
Version of template:	13.02

### 2.5 Applicant's details

Applicant's name:	STRAFFR GmbH
Address:	Gottschalkstr. 22 34127 Kassel  Germany
Contact Person:	Torben Hellmuth
Contact Person's Email:	torben@straffr.com

### 2.6 Manufacturer's details

Manufacturer's name:	please see applicant
Address:	please see applicant

## 2.7 EUT: Type, S/N etc. and short descriptions used in this test report

Short description*)	PMT Sample No.	EUT	Type	S/N	HW status	SW status
EUT 1	20-1-00804S02	smart resistance band	STRAFFR Band ST01X	tbd	8.3	9.0

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

## 2.8 Auxiliary Equipment (AE): Type, S/N etc. and short descriptions

Short description*)	PMT Sample No.	Auxiliary Equipment	Type	S/N	HW status	SW status
AE 1	20-1-00804S08	Samsung AC/DC Charger	EP-TA200	R37MAP648P2RT3	5V / 2A	--

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

## 2.9 Connected cables

Cable short description *)	Cable type	Connectors	Length
CAB 1	USB-C cable	--	80 cm

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

## 2.10 EUT set-ups

set-up no. *)	Combination of EUT and AE	Description
1	EUT 1 + AE 1	--

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

## 2.11 EUT operation modes

EUT operating mode no. *)	Operating modes	Additional information
Operating mode 1	Normal mode	Straffr Band in normal mode, BT switched off

\*) 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

<b>Product name</b>	STRAFFR Band ST01X	
<b>Kind of product</b>	smart resistance band	
<b>Firmware</b>	<input checked="" type="checkbox"/> for normal use	<input type="checkbox"/> Special version for test execution
	<input type="checkbox"/> AC Mains	single line (L1/N), 120VAC 60Hz
	<input checked="" type="checkbox"/> DC Mains	5 VDC via AE1
	<input checked="" type="checkbox"/> Battery	3.3 V
<b>EUT sample type</b>	<b>Production</b>	
<b>Weight</b>	--	
<b>PCB Size</b>	24.8mm / 31mm	
<b>Interfaces/Ports</b>	USB C	
For further details refer Applicants Declaration & following technical documents: --		

#### 3.2 Modifications on Test sample

<b>Additions/deviations or exclusions</b>	--
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## 4 Measurements

### 4.1 AC-Power Lines Conducted Emissions

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

The radio frequency voltage conducted back into the AC power line in the frequency range 150 kHz to 30 MHz has to be investigated.

Compliance should be tested by measuring the radio frequency voltage between each power line and ground at the power terminals in the stated frequency range.

A 50 Ohm / 50  $\mu$ H line impedance stabilization network (LISN) is used coupling the interface to the measurement equipment.

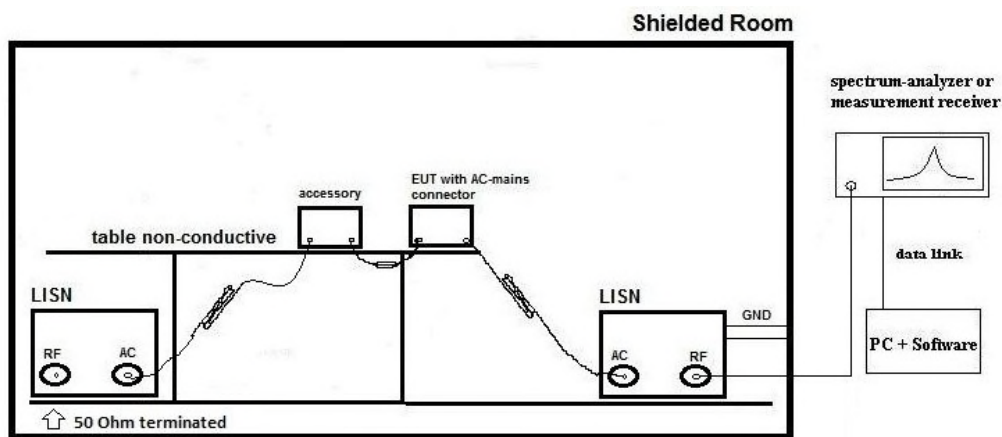
The EUT power input leads are connected through the LISN to the AC-power source. The LISN enclosure is electrically connected to the ground plane. The measuring instrument is connected to the coaxial output of the LISN.

Tabletop devices were set-up on an 80 cm height above reference ground plane, floor standing equipment 10 cm raised above ground plane.

Measurements have been performed on each phase line and neutral line of the devices AC-power lines.

The EUT was power supplied with 120 V/60 Hz. The EUT was tested in the defined operating mode and installed (connected) to accessory equipment according to the general description of use given by the applicant.

#### 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

As a first step, determines the worst-case phase line (neutral or phase) as well as the most critical operating mode of the equipment. A complete frequency-sweep with PK-Detector is performed on each current-carrying conductor.

#### Final measurement on critical frequencies

For power phases and critical frequencies (Margin to AV- or QP limit lower than 3 dB) as a second step includes measurements with receivers detector set to Quasi-Peak and Average.

### Formula:

$$V_C = V_R + C_L \quad (1)$$

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

$V_C$  = measured Voltage –corrected value

$V_R$  = Receiver reading

$C_L$  = Cable loss

$M$  = Margin

$L_T$  = Limit

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

### 4.1.2 Limit

Frequency Range [MHz]	Class B <input checked="" type="checkbox"/>		Class A <input type="checkbox"/>	
	QUASI-Peak [dBμV]	AVERAGE [dBμV]	QUASI-Peak [dBμV]	AVERAGE [dBμV]
0.15 – 0.5	66 to 56*	56 to 46*	79	66
0.5 – 5	56	46	73	60
5 – 30	60	50	73	60

### 4.1.3 Result

Diagram	Set-Up	Op. - Mode	Power Line	Max [dBμV]	Limit [dBμV]	Margin to Limit [dB]	Detector	Result
1.01	1	1	N/L1	40.28	66.00	25.72	Quasi peak	Passed

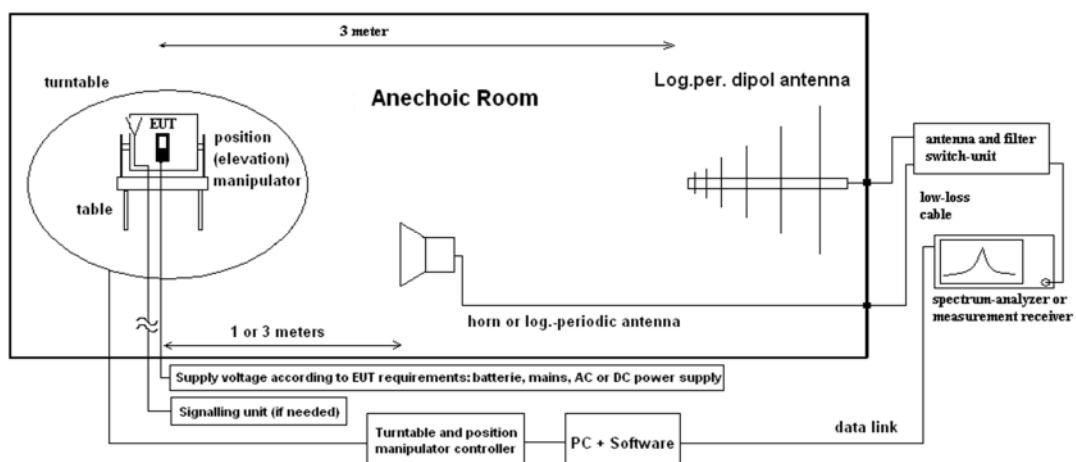
Remark: for more informations and graphical plot see annex A1 **CETECOM\_TR20\_1\_0080401T02a\_A1**

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

### 4.2.1 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 table of 0.8 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 20°). 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 maintaining 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.

### 4.2.2 Measurement Location

Test site	120901 - SAC - Radiated Emission <1GHz
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### 4.2.3 Limit

Frequency Range [MHz]	Class B <input checked="" type="checkbox"/> (3 meters)		Class A <input type="checkbox"/> (10 meters)		Detector	RBW / VBW [kHz]
	Limit [ $\mu$ V/m]	Limit [dB $\mu$ V/m]	Limit [ $\mu$ V/m]	Limit [dB $\mu$ V/m]		
30 - 88	100	40.0	90	39.0	Quasi peak	100 / 300
88 - 216	150	43.5	150	43.5	Quasi peak	100 / 300
216 - 960	200	46.0	210	46.4	Quasi peak	100 / 300
960 - 1000	500	54.0	300	49.5	Quasi peak	100 / 300

### 4.2.4 Result

Diagram	Channel	Op.Mode	Maximum Level [dB $\mu$ V/m] Frequency Range 30 – 1000MHz	Result
3.01	--	1	33.82 dB $\mu$ V/m @ 928.45 GHz	PASSED
3.02	--	1	30.04 dB $\mu$ V/m @ 927.16 GHz	PASSED

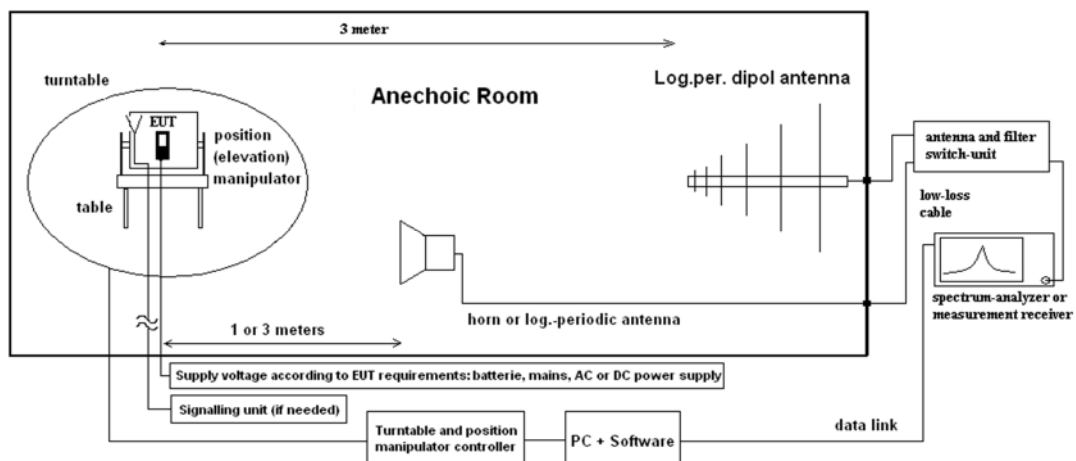
Remark: for more information and graphical plot see annex A1 CETECOM\_TR20\_1\_0080401T02a\_A1

### 4.3 Radiated field strength emissions above 1 GHz

#### 4.3.1 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 table of 0.8 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 15°). 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 maintaining 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.

### 4.3.2 Measurement Location

Test site	120904 - FAC1 - Radiated Emissions
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### 4.3.3 Limit

Radiated emissions limits (3 meters)				
Frequency Range [MHz]	Limit [ $\mu\text{V/m}$ ]	Limit [ $\text{dB}\mu\text{V/m}$ ]	Detector	RBW / VBW [kHz]
Above 1000	500	54	Average	1000 / 3000
Above 1000	5000	74	Peak	1000 / 3000

### 4.3.4 Result

Diagram	Channel	Op.Mode	Maximum Level [ $\text{dB}\mu\text{V/m}$ ] Frequency Range 1 – 18 GHz	Result
4.01	--	1	41.86 $\text{dB}\mu\text{V/m}$ @ 35.93 GHz	PASSED

Remark: for more information and graphical plot see annex A1 CETECOM\_TR20\_1\_0080401T02a\_A1

Diagram	Channel	Op.Mode	Maximum Level [ $\text{dB}\mu\text{V/m}$ ] Frequency Range 1 – 18 GHz	Result
4.02	--	1	56.71 $\text{dB}\mu\text{V/m}$ @ 24.87 GHz	PASSED

Remark: for more information and graphical plot see annex A1 CETECOM\_TR20\_1\_0080401T02a\_A1

#### 4.4 Results from external laboratory

None

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#### 4.5 Opinions and interpretations

None

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### 5 Equipment lists

ID	Description	Manufacturer	SerNo	Cal due date
120901 - SAC - Radiated Emission <1GHz				
21.07.2025				
2057 4	Biconilog Hybrid Antenna BTA-L	Frankonia GmbH	980026L	03.05.2022
2048 7	CETECOM Semi Anechoic Chamber < 1GHz	ETS-Lindgren GmbH	-	15.07.2025
2034 1	Digital Multimeter Fluke 112	Fluke Deutschland GmbH	81650455	25.05.2022
2062 0	EMI Test Receiver ESU26	Rohde & Schwarz Messgerätebau GmbH	100362	13.05.2021
2048 2	filter matrix Filter matrix SAR 1	CETECOM GmbH	-	
2088 5	Power Supply EA3632A	Agilent Technologies Deutschland GmbH	75305850	
120904 - FAC1 - Radiated Emissions				
2072 0	EMC32 [FAC]	Rohde & Schwarz Messgerätebau GmbH	V10.52	
2048 9	EMI Test Receiver ESU40	Rohde & Schwarz Messgerätebau GmbH	1000-30	13.05.2021
2025 4	High Pass Filter 5HC 2600/12750-1.5KK (GSM1800/1900/DECT)	Trilithic	23042	
2054 9	Log.Per-Antenna HL025	Rohde & Schwarz Messgerätebau GmbH	1000060	31.07.2021

ID	Description	Manufacturer	SerNo	Cal due date
2061 1	Power Supply E3632A	Agilent Technologies Deutschland GmbH	KR 75305854	
2033 8	Pre-Amplifier 100MHz - 26GHz JS4-00102600-38-5P	Miteq Inc.	838697	
2048 4	Pre-Amplifier 2,5GHz - 18GHz AMF-5D-02501800-25-10P	Miteq Inc.	1244554	
2028 7	Pre-Amplifier 25MHz - 4GHz AMF-2D-100M4G-35-10P	Miteq Inc.	379418	
2069 0	Spectrum Analyzer FSU	Rohde & Schwarz Messgerätebau GmbH	100302/026	23.05.2021

Tools used in 'P1M1'



## 6 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.

RF-Measurement	Reference	Frequency range	Calculated uncertainty based on a confidence level of 95%						Remarks
Conducted emissions (U <sub>CISPR</sub> )	-	9 kHz - 150 kHz 150 kHz - 30 MHz	4.0 dB 3.6 dB						-
Power Output radiated	-	30 MHz - 4 GHz	3.17 dB						Substitution method
Power Output conducted	-	Set-up No.	Cel-C1	Cel-C2	BT1	W1	W2	--	-
		9 kHz - 12.75 GHz	N/A	0.60	0.7	0.25	N/A	--	
		12.75 GHz - 26.5 GHz	N/A	0.82	--	N/A	N/A	--	
Conducted emissions on RF-port	-	9 kHz - 2.8 GHz	0.70	N/A	0.70	N/A	0.69	--	N/A - not applicable
		2.8 GHz - 12.75 GHz	1.48	N/A	1.51	N/A	1.43	--	
		12.75 GHz – 18 GHz	1.81	N/A	1.83	N/A	1.77	--	
		18 GHz - 26.5 GHz	1.83	N/A	1.85	N/A	1.79	--	
Occupied bandwidth	-	9 kHz - 4 GHz	0.1272 ppm (Delta Marker)						Frequency error
			1.0 dB						Power
Emission bandwidth	-	9 kHz - 4 GHz	0.1272 ppm (Delta Marker)						Frequency error
	-		See above: 0.70 dB						Power
Frequency stability	-	9 kHz - 20 GHz	0.0636 ppm						-
Radiated emissions Enclosure	-	150 kHz - 30 MHz	5.01dB						Magnetic field strength
		30 MHz - 1 GHz	5.83 dB						Electrical Field strength
		1 GHz - 18 GHz	4.91 dB						
		18 GHz - 26.5 GHz	5.06 dB						

## 7 Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2020-Sep-09
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# End Of Test Report