R F – T E S T R E P O R T

- FCC Part 15.225, RSS 210 -

Type / Model Name	:	M2Smart®SE
Product Description	:	Mobile handheld computer with battery
Applicant	:	ACD Elektronik GmbH
Address	:	Engelberg 2
		88480 ACHSTETTEN, GERMANY
Manufacturer	:	ACD Elektronik GmbH
Address	:	Engelberg 2
		88480 ACHSTETTEN, GERMANY

Test Result according to the standards listed in clause 1 test standards:	**POSITIVE**

Test Report No. :	**T47042-00-02SK**	04. October 2021 Date of issue

Deutsche Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

Contents

ATTACHMENT A as separate supplement

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October, 2020)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidth

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2020)

Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.225	Operation within the band 13.110 - 14.010 MHz

RSS-Gen Issue 5, March 2019	General Requirements and Information for the Certification of Radiocommunication Equipment
RSS-210 Issue 10, December 2019	Low Power Licence – Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

2 EQUIPMENT UNDER TEST

2.1 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

2.2 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according his/her instructions.

2.3 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.4 Short description of the equipment under test (EUT)

The EUT is a mobile handheld computer for mobile acquisition and transmission of data. It is equipped with a WLAN/BT5 2x2 MU-MIMO module SPB228 (802.11 ac/a/b/g/n, BLE 5.0) and RFID (13.56 MHz). The EUT can be charged in a docking station.

There are also different slide on UHF RFID devices available for use of the device as handheld terminal. It is powered by the EUT and can operate simultaneously with the integrated 13.56 MHz transceiver. For evaluation of the slide on devices and simultaneous transmission please refer to the corresponding test reports.

Number of tested samples:	1
Serial number:	193600000151
Firmware:	16.68.10.p16

2.5 EUT operation mode

The equipment under test was operated during the measurement under the following conditions:

- RFID modulated

- Simultaneous transmission: RFID modulated and 2.4 GHz continuous transmission

- Simultaneous transmission: RFID modulated and 5 GHz continuous transmission

2.6 EUT configuration

The following peripheral devices and interface cables were connected during the measurements:

-	Docking station	Model :	DS2Smart, ACD Elektronik GmbH
-	-	Model :	-

2.7 Power supply system utilised

Power supply voltage	:	3.8 V/DC (battery pack)
Power supply voltage (alternative)	:	15.0 V/DC (docking station)

3 SUMMARY

3.1 TEST RESULTS

FCC Rule Part	RSS Rule Part	Description	Result
15.207	RSS Gen, 8.8	AC power line conducted emissions	passed
15.225	RSS-210, B.6	Field strength of fundamental	passed
15.209	RSS Gen, 8.9	Spurious emissions	passed
15.225	RSS-210, B.6	Frequency tolerance	passed
15.215	RSS-Gen, 6.7	Occupied bandwidth	passed
15.225	RSS-210, B.6	Transmitter spectrum mask	passed

3.2 FINAL ASSESSMENT

The equipment under test fulfils the requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 13 January 2021

Testing concluded on : 19 January 2021

Checked by:

Klaus Gegenfurtner
2021.10.05 11:21:22
+02'00'

Klaus Gegenfurtner
Radio Team

Tested by:

Sabine Kugler
2021.10.04 14:01:04
+02'00'

Sabine Kugler
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 % The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 2011 + A1 / 2014 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
20 dB Bandwidth	Center frequency of EuT	95%	± 2.5 x 10^{-7}
99% Occupied Bandwidth	Center frequency of EuT	95%	± 2.5 x 10^{-7}
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Peak conducted output power	902 MHz to 928 MHz	95%	± 0.35 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB

4.4 Conformity Decision Rule

The conformity decision rule is based on the ILAC G8 published at the time of reporting.

4.5 Measurement Protocol for FCC

4.5.1 GENERAL INFORMATION

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011
ISED: DE0009

4.5.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

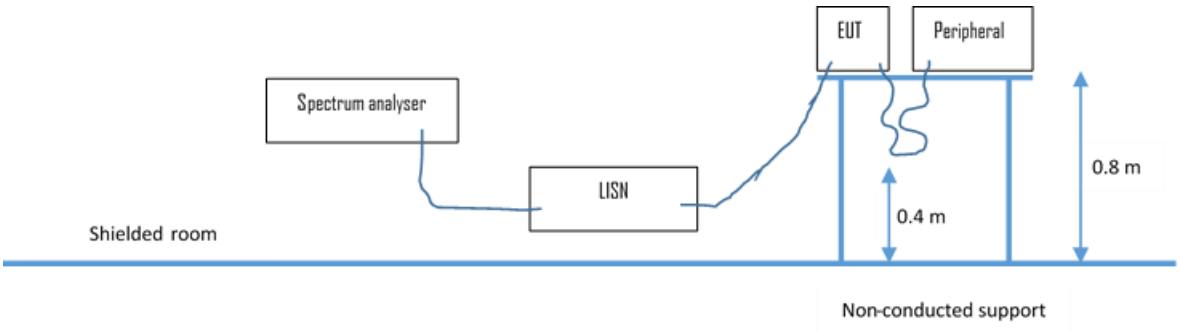
4.5.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions.

4.5.3 Details of test procedures

4.5.3.1 Conducted emission

Test setup according ANSI C63.10



The final level, expressed in dBμV, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between dBμV and μV, the following conversions apply:

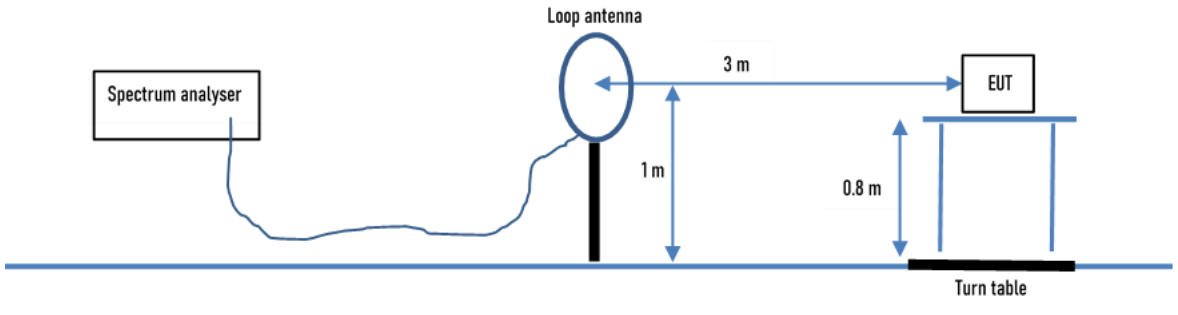
dBμV = 20(log μV)
μV = Inverse log(dBμV/20)

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 μH (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.5.3.2 Radiated emission

4.5.3.2.1 OATS1 test site (9 kHz - 30 MHz):

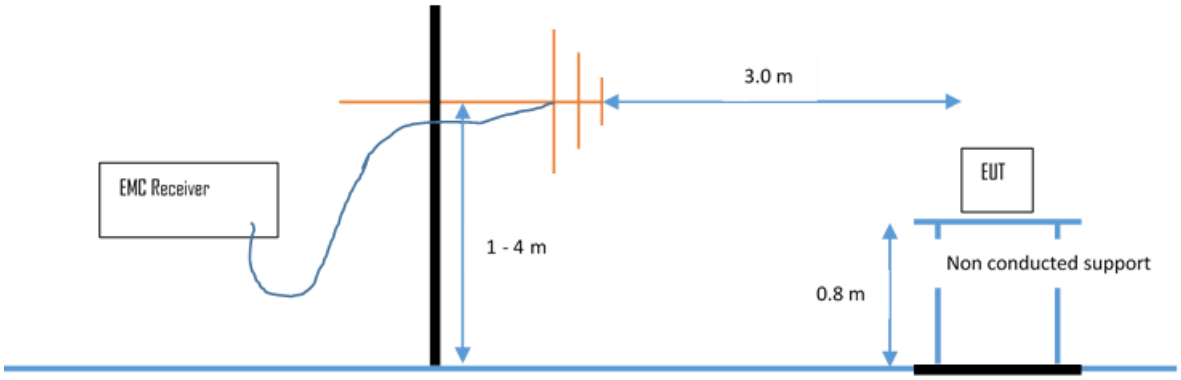
Test setup according ANSI C63.10



Emissions from the EUT are measured in the frequency range of 9 MHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres from the EUT. To locate maximum emissions from the test sample the test loop antenna is positioned in 3 orthogonal planes, with its plane horizontal (parallel to the ground) and is varied along the vertical axis, while the EUT is rotated 360 degrees.

4.5.3.2.2 OATS1 test site (30 MHz - 1 GHz):

Test setup according ANSI C63.10.



Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees. The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency (MHz)	Level (dBµV)	+	Factor (dB)	=	Level (dBµV/m)	-	Limit (dBµV/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

5 TEST CONDITIONS AND RESULTS

5.1 Conducted emissions

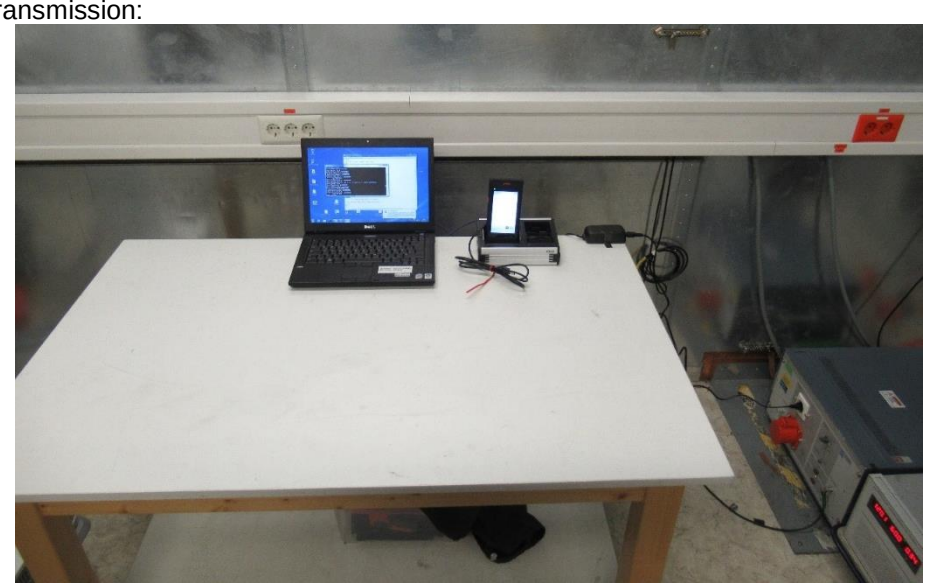
For test instruments and accessories used, see section 6 Part **A 4**.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up

RFID modulated transmission:



Simultaneous transmission:

5.1.3 Applicable standard

FCC Part 15, Section 15.207 and RSS-Gen clause 8.8

5.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin -20.7 dB at 13.56 MHz

Limit according to FCC Part 15, Section 15.207 and RSS-Gen clause 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

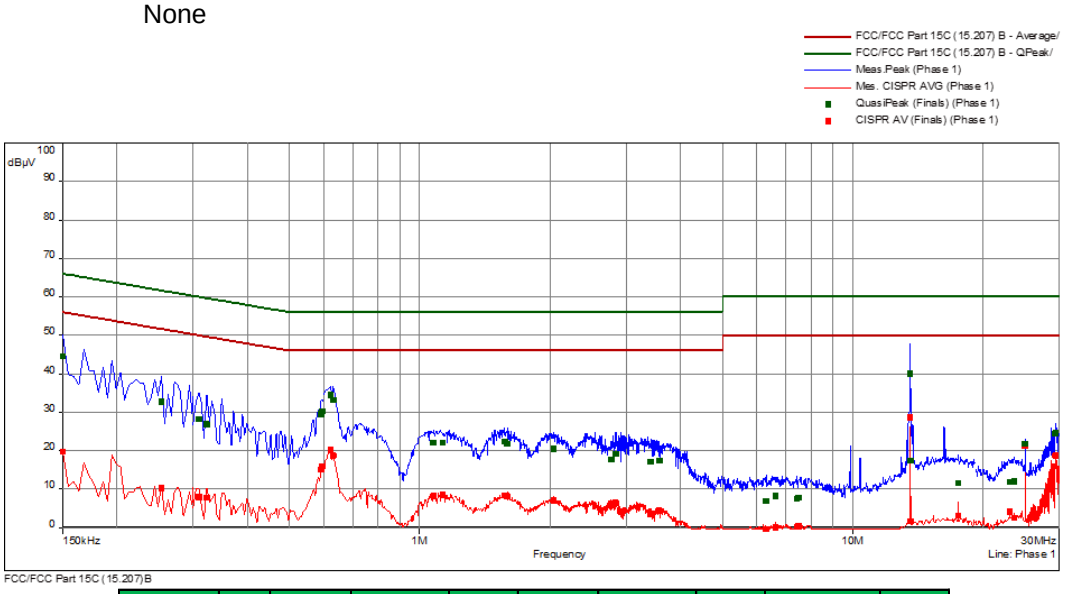
The requirements are **FULFILLED.**

Remarks: For detailed test result please refer to following test protocols

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

5.1.5 Test protocol

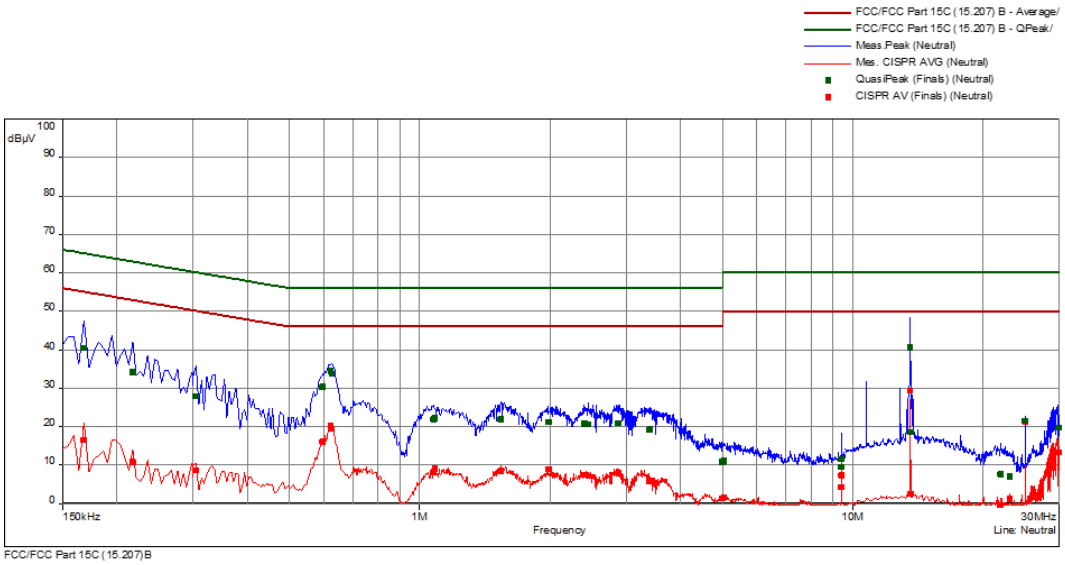
Test point L1 Result: Passed
Operation mode: RFID modulated
Remarks: None



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.150	1	44.6	-21.4	66.0	19.8	-36.2	56.0	Phase 1	10.1
0.254	1	32.9	-28.8	61.6	10.3	-41.4	51.6	Phase 1	10.2
0.309	2	28.2	-31.8	60.0	8.0	-42.0	50.0	Phase 1	10.2
0.323	2	26.9	-32.8	59.6	7.9	-41.8	49.6	Phase 1	10.2
0.593	2	29.6	-26.4	56.0	15.2	-30.9	46.0	Phase 1	10.2
0.597	2	30.3	-25.7	56.0	16.0	-30.0	46.0	Phase 1	10.2
0.623	3	34.5	-21.5	56.0	20.2	-25.8	46.0	Phase 1	10.2
0.632	3	33.3	-22.7	56.0	18.8	-27.2	46.0	Phase 1	10.2
1.077	3	22.1	-33.9	56.0	8.2	-37.8	46.0	Phase 1	10.3
1.131	3	22.1	-33.9	56.0	8.5	-37.5	46.0	Phase 1	10.3
1.569	4	22.4	-33.6	56.0	8.4	-37.6	46.0	Phase 1	10.3
1.596	4	21.9	-34.1	56.0	8.1	-37.9	46.0	Phase 1	10.3
2.037	4	20.5	-35.5	56.0	7.0	-39.0	46.0	Phase 1	10.3
2.765	5	17.8	-38.2	56.0	6.2	-39.8	46.0	Phase 1	10.4
2.832	5	19.3	-36.8	56.0	6.6	-39.4	46.0	Phase 1	10.4
3.417	5	17.2	-38.8	56.0	3.6	-42.4	46.0	Phase 1	10.4
3.570	5	17.5	-38.5	56.0	4.4	-41.6	46.0	Phase 1	10.4
6.303	6	6.9	-53.1	60.0	-0.3	-50.3	50.0	Phase 1	10.6
6.632	6	8.2	-51.8	60.0	0.2	-49.8	50.0	Phase 1	10.7
7.419	6	7.6	-52.4	60.0	0.2	-49.8	50.0	Phase 1	10.7
7.505	6	7.7	-52.3	60.0	0.4	-49.6	50.0	Phase 1	10.7
13.560	7	40.1	-19.9	60.0	28.8	-21.3	50.0	Phase 1	11.2
13.587	7	17.4	-42.6	60.0	1.6	-48.4	50.0	Phase 1	11.2
17.489	7	11.7	-48.3	60.0	3.2	-46.9	50.0	Phase 1	11.5
23.034	8	12.0	-48.0	60.0	4.2	-45.8	50.0	Phase 1	11.8
23.574	8	12.1	-47.9	60.0	2.6	-47.5	50.0	Phase 1	11.8
25.001	8	21.7	-38.3	60.0	21.3	-28.7	50.0	Phase 1	11.8
29.411	8	24.6	-35.5	60.0	18.9	-31.1	50.0	Phase 1	11.9

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

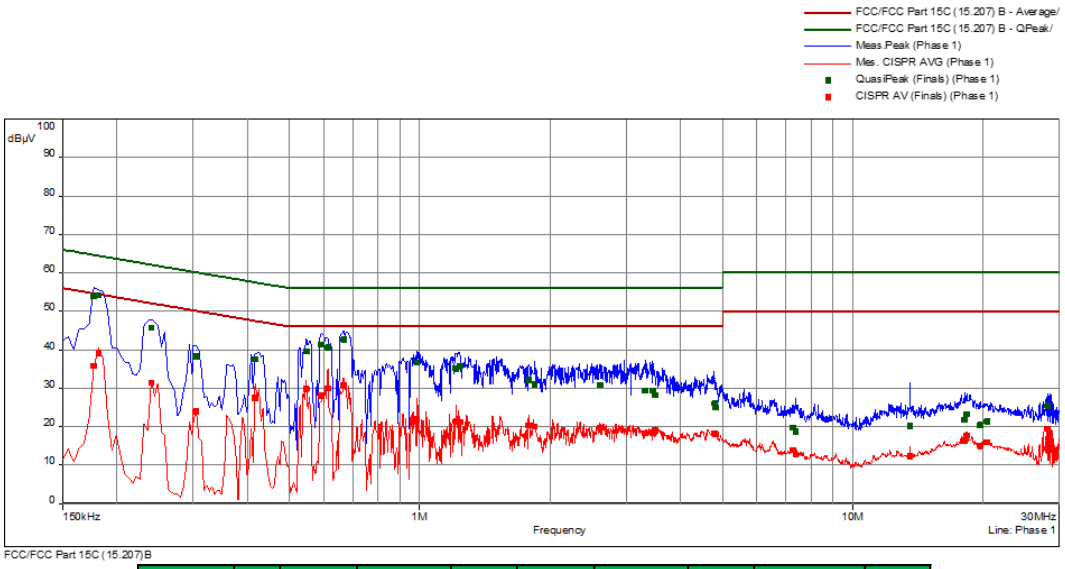
Test point N Result: Passed
Operation mode: RFID modulated
Remarks: None



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.168	9	40.5	-24.5	65.1	16.6	-38.5	55.1	Neutral	10.1
0.218	9	34.1	-28.8	62.9	10.8	-42.1	52.9	Neutral	10.2
0.305	10	28.0	-32.2	60.1	8.7	-41.4	50.1	Neutral	10.2
0.597	10	30.3	-25.7	56.0	16.1	-29.9	46.0	Neutral	10.2
0.623	11	34.5	-21.5	56.0	20.1	-25.9	46.0	Neutral	10.2
0.627	11	33.9	-22.2	56.0	19.6	-26.4	46.0	Neutral	10.2
1.077	11	22.0	-34.0	56.0	8.2	-37.8	46.0	Neutral	10.3
1.086	11	22.2	-33.9	56.0	9.3	-36.7	46.0	Neutral	10.3
1.542	12	22.0	-34.0	56.0	8.5	-37.5	46.0	Neutral	10.3
1.979	12	21.3	-34.7	56.0	9.0	-37.0	46.0	Neutral	10.3
2.400	12	20.8	-35.2	56.0	7.5	-38.5	46.0	Neutral	10.4
2.450	13	20.6	-35.4	56.0	7.3	-38.7	46.0	Neutral	10.4
2.882	13	21.0	-35.1	56.0	8.0	-38.0	46.0	Neutral	10.4
3.399	13	19.4	-36.7	56.0	6.0	-40.0	46.0	Neutral	10.4
3.404	13	19.3	-36.7	56.0	5.7	-40.3	46.0	Neutral	10.4
4.989	14	10.9	-45.2	56.0	1.4	-44.6	46.0	Neutral	10.5
5.043	14	11.3	-48.7	60.0	1.8	-48.2	50.0	Neutral	10.5
9.417	14	9.6	-50.4	60.0	4.3	-45.8	50.0	Neutral	10.8
9.422	14	11.6	-48.4	60.0	7.4	-42.6	50.0	Neutral	10.8
13.560	15	40.7	-19.3	60.0	29.3	-20.7	50.0	Neutral	11.0
13.587	15	18.7	-41.3	60.0	2.6	-47.5	50.0	Neutral	11.0
21.905	16	7.7	-52.3	60.0	-0.1	-50.1	50.0	Neutral	11.4
23.039	16	7.1	-52.9	60.0	1.3	-48.7	50.0	Neutral	11.4
25.001	16	21.5	-38.6	60.0	21.3	-28.7	50.0	Neutral	11.4
29.816	16	19.8	-40.2	60.0	13.4	-36.6	50.0	Neutral	11.3

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

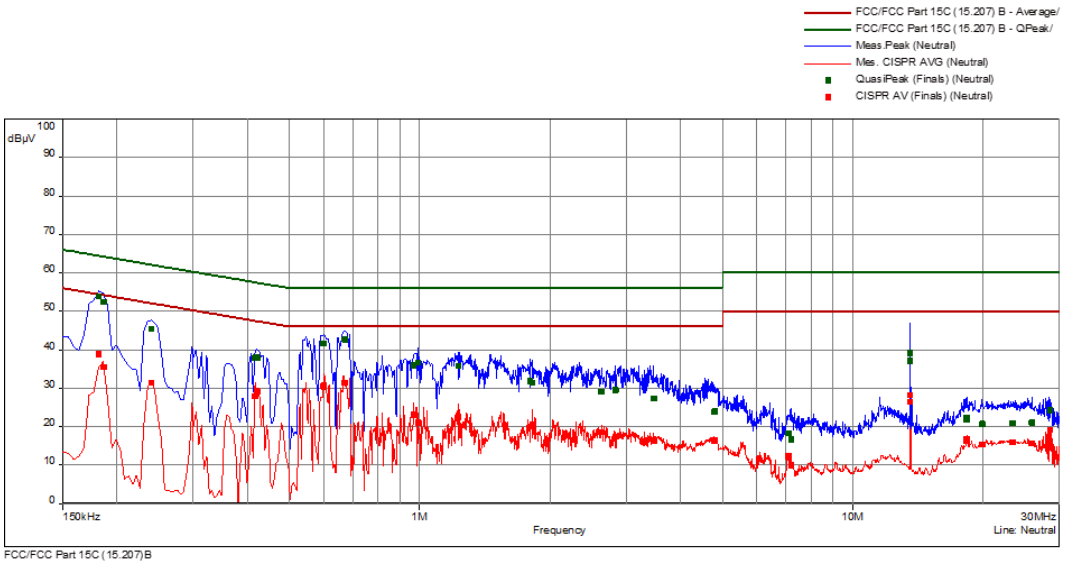
Test point L1 Result: passed
Operation mode: Simultaneous transmission: RFID modulated and 2.4 GHz continuous transmission
Remarks: None



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.177	1	53.9	-10.7	64.6	35.8	-18.8	54.6	Phase 1	10.1
0.182	1	54.3	-10.2	64.4	39.2	-15.3	54.4	Phase 1	10.1
0.240	1	45.8	-16.3	62.1	31.4	-20.7	52.1	Phase 1	10.1
0.305	2	38.3	-21.8	60.1	24.1	-26.1	50.1	Phase 1	10.1
0.417	2	37.5	-20.0	57.5	27.5	-20.0	47.5	Phase 1	10.2
0.548	2	39.7	-16.3	56.0	29.8	-16.2	46.0	Phase 1	10.2
0.593	2	41.5	-14.6	56.0	28.1	-17.9	46.0	Phase 1	10.2
0.614	3	40.6	-15.4	56.0	30.0	-16.0	46.0	Phase 1	10.2
0.668	3	42.6	-13.4	56.0	30.9	-15.1	46.0	Phase 1	10.2
0.987	3	36.7	-19.3	56.0	22.0	-24.0	46.0	Phase 1	10.2
1.214	4	35.2	-20.8	56.0	21.4	-24.6	46.0	Phase 1	10.2
1.236	4	35.7	-20.3	56.0	21.3	-24.7	46.0	Phase 1	10.2
1.785	4	32.1	-23.9	56.0	20.4	-25.7	46.0	Phase 1	10.3
1.844	4	31.1	-25.0	56.0	20.0	-26.0	46.0	Phase 1	10.3
2.607	5	30.9	-25.2	56.0	19.7	-26.3	46.0	Phase 1	10.3
3.318	5	29.4	-26.6	56.0	18.3	-27.7	46.0	Phase 1	10.4
3.444	5	29.4	-26.6	56.0	18.4	-27.7	46.0	Phase 1	10.4
3.503	5	28.2	-27.8	56.0	19.1	-26.9	46.0	Phase 1	10.4
4.805	6	26.0	-30.0	56.0	18.3	-27.7	46.0	Phase 1	10.4
4.818	6	25.1	-30.9	56.0	18.1	-27.9	46.0	Phase 1	10.4
7.271	6	19.9	-40.2	60.0	14.0	-36.1	50.0	Phase 1	10.6
7.397	6	18.7	-41.3	60.0	12.8	-37.2	50.0	Phase 1	10.6
13.547	7	20.2	-39.8	60.0	12.3	-37.7	50.0	Phase 1	11.1
18.137	7	21.8	-38.2	60.0	16.4	-33.6	50.0	Phase 1	11.4
18.321	7	23.4	-36.7	60.0	17.8	-32.2	50.0	Phase 1	11.4
19.682	8	20.5	-39.5	60.0	15.0	-35.0	50.0	Phase 1	11.4
20.415	8	21.4	-38.6	60.0	15.9	-34.1	50.0	Phase 1	11.5
28.110	8	25.5	-34.5	60.0	19.5	-30.5	50.0	Phase 1	11.7

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

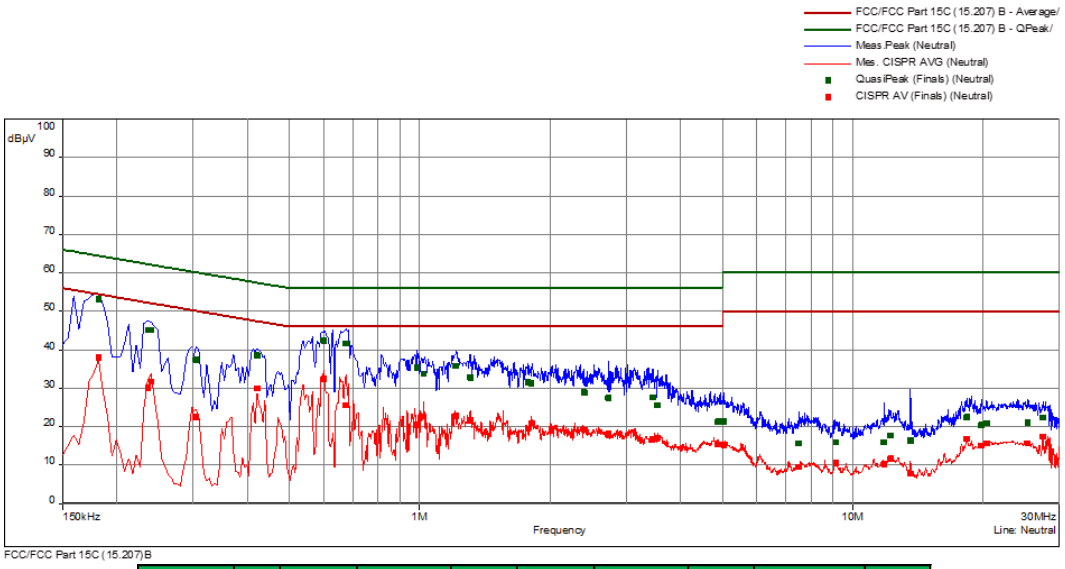
Test point	N	Result: passed
Operation mode:	Simultaneous transmission: RFID modulated and 2.4 GHz continuous transmission	
Remarks:	None	



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.182	9	53.9	-10.5	64.4	38.9	-15.5	54.4	Neutral	10.1
0.186	9	52.4	-11.8	64.2	35.5	-18.7	54.2	Neutral	10.1
0.240	9	45.5	-16.6	62.1	31.4	-20.7	52.1	Neutral	10.1
0.417	10	37.9	-19.6	57.5	27.9	-19.6	47.5	Neutral	10.2
0.422	10	37.9	-19.5	57.4	29.3	-18.2	47.4	Neutral	10.2
0.600	10	41.7	-14.3	56.0	30.7	-15.3	46.0	Neutral	10.2
0.600	11	41.6	-14.4	56.0	30.5	-15.5	46.0	Neutral	10.2
0.672	11	42.7	-13.3	56.0	31.5	-14.5	46.0	Neutral	10.2
0.969	11	36.0	-20.0	56.0	23.1	-22.9	46.0	Neutral	10.2
0.992	11	36.7	-19.3	56.0	21.0	-25.0	46.0	Neutral	10.2
1.227	12	35.9	-20.1	56.0	22.5	-23.5	46.0	Neutral	10.2
1.803	12	31.9	-24.1	56.0	20.0	-26.0	46.0	Neutral	10.3
1.821	12	31.5	-24.6	56.0	20.4	-25.6	46.0	Neutral	10.3
2.630	13	29.1	-26.9	56.0	18.7	-27.4	46.0	Neutral	10.3
2.832	13	29.5	-26.5	56.0	17.4	-28.6	46.0	Neutral	10.3
3.467	13	27.3	-28.7	56.0	16.5	-29.5	46.0	Neutral	10.4
4.800	14	24.0	-32.0	56.0	16.5	-29.5	46.0	Neutral	10.4
4.805	14	24.0	-32.0	56.0	16.2	-29.8	46.0	Neutral	10.4
7.104	14	18.3	-41.7	60.0	12.4	-37.6	50.0	Neutral	10.6
7.203	14	16.7	-43.3	60.0	10.0	-40.0	50.0	Neutral	10.6
13.560	15	39.2	-20.8	60.0	28.2	-21.8	50.0	Neutral	10.9
13.565	15	37.3	-22.8	60.0	26.5	-23.6	50.0	Neutral	10.9
18.321	15	22.4	-37.6	60.0	16.9	-33.1	50.0	Neutral	11.2
18.330	15	21.9	-38.1	60.0	16.4	-33.6	50.0	Neutral	11.2
19.880	16	20.8	-39.2	60.0	15.5	-34.6	50.0	Neutral	11.2
23.367	16	21.0	-39.0	60.0	16.0	-34.0	50.0	Neutral	11.3
25.896	16	21.1	-38.9	60.0	15.8	-34.3	50.0	Neutral	11.2
28.466	16	24.3	-35.7	60.0	19.2	-30.8	50.0	Neutral	11.1

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

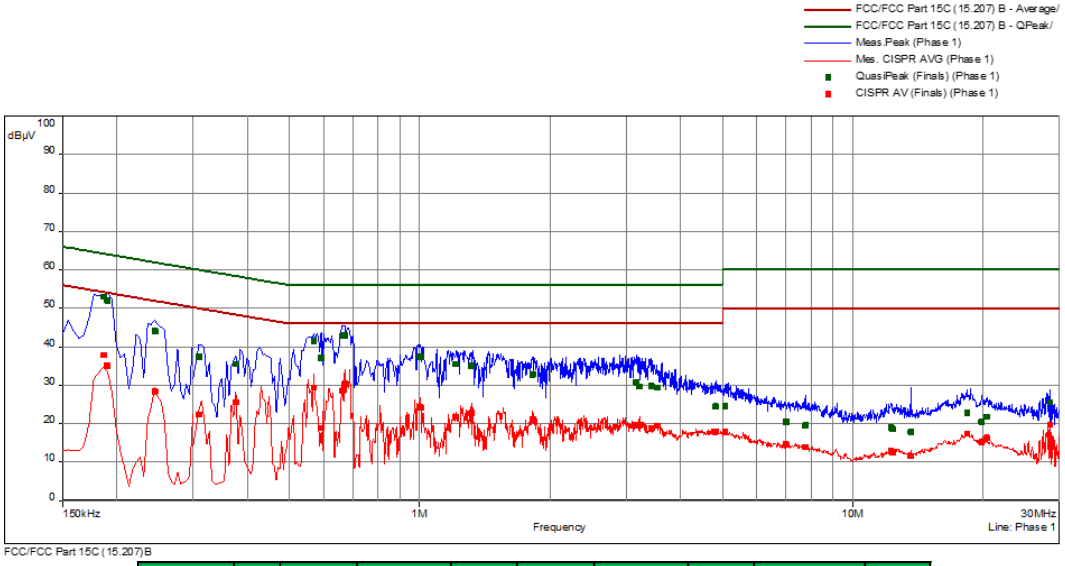
Test point	N	Result: passed
Operation mode:	Simultaneous transmission: RFID modulated and 5 GHz continuous transmission	
Remarks:	None	



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.182	9	53.2	-11.3	64.4	37.9	-16.5	54.4	Neutral	10.1
0.236	9	45.2	-17.0	62.3	30.2	-22.1	52.3	Neutral	10.1
0.240	9	45.2	-16.9	62.1	31.9	-20.3	52.1	Neutral	10.1
0.305	10	37.4	-22.7	60.1	22.5	-27.6	50.1	Neutral	10.1
0.422	10	38.5	-18.9	57.4	29.9	-17.5	47.4	Neutral	10.2
0.600	10	42.4	-13.6	56.0	32.3	-13.7	46.0	Neutral	10.2
0.600	11	42.5	-13.5	56.0	32.4	-13.6	46.0	Neutral	10.2
0.677	11	41.7	-14.3	56.0	25.5	-20.5	46.0	Neutral	10.2
0.987	11	35.3	-20.7	56.0	20.6	-25.4	46.0	Neutral	10.2
1.023	11	33.9	-22.1	56.0	22.7	-23.3	46.0	Neutral	10.2
1.214	12	35.8	-20.2	56.0	22.8	-23.2	46.0	Neutral	10.2
1.308	12	32.9	-23.1	56.0	21.7	-24.3	46.0	Neutral	10.3
1.776	12	31.6	-24.4	56.0	19.4	-26.6	46.0	Neutral	10.3
1.812	12	31.3	-24.7	56.0	21.0	-25.0	46.0	Neutral	10.3
2.400	13	29.0	-27.1	56.0	19.3	-26.7	46.0	Neutral	10.3
2.729	13	27.5	-28.5	56.0	18.1	-27.9	46.0	Neutral	10.3
3.453	13	27.6	-28.4	56.0	16.8	-29.2	46.0	Neutral	10.4
3.539	13	25.7	-30.3	56.0	17.1	-28.9	46.0	Neutral	10.4
4.877	14	21.4	-34.6	56.0	15.4	-30.6	46.0	Neutral	10.4
5.043	14	21.4	-38.6	60.0	15.2	-34.8	50.0	Neutral	10.4
7.500	14	15.8	-44.2	60.0	9.7	-40.4	50.0	Neutral	10.6
9.125	14	16.0	-44.0	60.0	10.5	-39.5	50.0	Neutral	10.7
11.801	15	16.0	-44.0	60.0	10.3	-39.7	50.0	Neutral	10.8
12.215	15	17.8	-42.2	60.0	11.8	-38.2	50.0	Neutral	10.8
13.596	15	16.5	-43.6	60.0	7.9	-42.1	50.0	Neutral	10.9
18.321	15	22.5	-37.5	60.0	16.8	-33.2	50.0	Neutral	11.2
19.835	16	20.5	-39.5	60.0	15.2	-34.8	50.0	Neutral	11.2
20.388	16	21.0	-39.0	60.0	15.7	-34.3	50.0	Neutral	11.3
25.370	16	21.0	-39.0	60.0	15.7	-34.3	50.0	Neutral	11.2
27.467	16	22.5	-37.6	60.0	17.5	-32.5	50.0	Neutral	11.2

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

Test point L1 Result: passed
Operation mode: Simultaneous transmission: RFID modulated and 5 GHz continuous transmission
Remarks: None



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.186	1	53.1	-11.1	64.2	37.9	-16.4	54.2	Phase 1	10.1
0.191	1	52.0	-12.0	64.0	35.2	-18.8	54.0	Phase 1	10.1
0.245	1	44.1	-17.9	61.9	28.5	-23.5	51.9	Phase 1	10.1
0.309	2	37.4	-22.6	60.0	22.4	-27.6	50.0	Phase 1	10.1
0.377	2	35.5	-22.9	58.4	25.5	-22.8	48.4	Phase 1	10.2
0.570	2	41.5	-14.5	56.0	29.5	-16.5	46.0	Phase 1	10.2
0.593	2	37.1	-18.9	56.0	18.9	-27.1	46.0	Phase 1	10.2
0.663	3	42.9	-13.1	56.0	28.7	-17.4	46.0	Phase 1	10.2
0.672	3	43.0	-13.0	56.0	30.4	-15.6	46.0	Phase 1	10.2
1.001	3	37.6	-18.4	56.0	24.4	-21.6	46.0	Phase 1	10.2
1.005	3	37.4	-18.6	56.0	24.2	-21.8	46.0	Phase 1	10.2
1.214	4	35.5	-20.5	56.0	21.8	-24.2	46.0	Phase 1	10.2
1.317	4	35.1	-20.9	56.0	22.9	-23.1	46.0	Phase 1	10.3
1.826	4	32.9	-23.1	56.0	21.3	-24.7	46.0	Phase 1	10.3
3.161	5	30.8	-25.2	56.0	19.7	-26.3	46.0	Phase 1	10.4
3.215	5	29.6	-26.4	56.0	19.6	-26.4	46.0	Phase 1	10.4
3.431	5	29.9	-26.2	56.0	18.8	-27.2	46.0	Phase 1	10.4
3.534	5	29.3	-26.7	56.0	19.4	-26.6	46.0	Phase 1	10.4
4.827	6	24.6	-31.4	56.0	17.9	-28.1	46.0	Phase 1	10.4
5.070	6	24.5	-35.5	60.0	17.9	-32.1	50.0	Phase 1	10.5
7.010	6	20.5	-39.5	60.0	14.6	-35.4	50.0	Phase 1	10.6
7.766	6	19.6	-40.4	60.0	13.9	-36.1	50.0	Phase 1	10.6
12.264	7	19.1	-40.9	60.0	12.9	-37.1	50.0	Phase 1	11.0
12.372	7	18.7	-41.3	60.0	12.6	-37.4	50.0	Phase 1	11.0
13.605	7	17.9	-42.1	60.0	11.7	-38.3	50.0	Phase 1	11.1
18.375	7	22.8	-37.2	60.0	17.4	-32.6	50.0	Phase 1	11.4
19.812	8	20.6	-39.4	60.0	15.2	-34.8	50.0	Phase 1	11.5
20.361	8	21.8	-38.2	60.0	16.4	-33.6	50.0	Phase 1	11.5
28.479	8	25.6	-34.4	60.0	19.9	-30.2	50.0	Phase 1	11.7

5.2 Field strength of the fundamental wave

For test instruments and accessories used see section 6 Part **CPR 1**.

5.2.1 Description of the test location

Test location: OATS1
Test distance: 3 metres

5.2.2 Photo documentation of the test set-up

5.2.3 Applicable standard

FCC Part 15, Section 15.225(a) and RSS-210 clause B.6(a)

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

5.2.4 Test result

a) Result at a measurement distance of 3m

Frequency (MHz)	Level (dBµV)	Ant. factor (dB 1/m)	Field strength dB(µV/m)
13.56	40.1	20.0	60.1

b) Result extrapolated to a distance of 30 m

Frequency (MHz)	Field strength dB(µV/m) @3m	Extrapolation factor (dB)	Field strength dB(µV/m) @30m	Limit dB(µV/m)	Delta (dB)
13.56	60.1	-40	20.1	84.0	-63.9

Limit according to FCC Part 15, Section 15.225(a): and RSS-210 clause B.6(a)

Frequency	Field strength of fundamental wave		Measurement distance
(MHz)	(µV/m)	dB(µV/m)	(metres)
13.553 - 13.567	15848	84.0	30

The requirements are **FULFILLED.**

Remarks: None

5.3 Spurious emissions

For test instruments and accessories used see section 6 Part **SER 1, SER 2**.

5.3.1 Description of the test location

Test location: OATS1
Test distance: 3 metres

5.3.2 Photo documentation of the test set-up

9 kHz – 30 MHz:

30 MHz – 1 GHz:

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

5.3.3 Applicable standard

FCC Part 15, Section 15.209 and RSS-Gen clause 8.9

The resolution bandwidth during the measurement is as follows:
9 kHz – 150 kHz: RBW: 200 Hz
150 kHz – 30 MHz: RBW: 9 kHz
30 MHz – 1000 MHz: RBW: 120 kHz

5.3.4 Test result <30MHz

FCC

f (MHz)	Level QP@3m (dBµV)	Ant. factor (dB/m)	Field strength QP@3m dB(µV/m)	Distance corr. 3m to 30m (dB)	Corrected level QP@30m dB(µV/m)	Limit QP@30m dB(µV/m)	Delta (dB)
27.12	5.1	20	25.1	-40	-14.9	29.5	-44.4

ISED

f (MHz)	Level QP@3m (dBµA)	Ant. factor (dB/m)	Field strength QP@3m dB(µA/m)	Distance corr. 3m to 30m (dB)	Corrected level QP@30m dB(µA/m)	Limit QP@30m dB(µA/m)	Delta (dB)
27.12	-46.4	20	-26.4	-40	-66.4	-22	-44.4

5.3.5 Test result 30 MHz < f < 1 GHz

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
44.00	4.8	-3.3	14.7	15.4	19.5	12.1	40.0	-20.5
106.00	4.2	3.8	13.0	12.0	17.2	15.8	43.5	-26.3
259.00	2.2	2.0	15.9	16.0	18.1	18.0	46.0	-27.9
352.80	-1.9	-1.6	18.8	19.1	16.9	17.5	46.0	-28.5
401.70	-2.7	-1.4	20.3	20.4	17.6	19.0	46.0	-27.0
603.80	-3.2	-2.6	25.1	25.4	21.9	22.8	46.0	-23.2
961.50	-2.6	-2.5	30.1	30.6	27.5	28.1	54.0	-25.9

Note: The correction factor includes cable loss and antenna factor.

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

Limit according to FCC Part 15 Subpart 15.209(a)

Frequency	Field strength of spurious emissions		Measurement distance
(MHz)	(µV/m)	dB(µV/m)	(metres)
0.009 - 0.490	2400/F(kHz)	--	300
0.490 - 1.705	24000/F (kHz)	--	30
1.705 - 30.0	30	29.5	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

Limit according to RSS-Gen clause 8.9

Frequency	Field strength of spurious emissions		Measurement distance
(MHz)	(µA/m)	dB(µA/m)	(metres)
0.009 - 0.490	6.37/F(kHz)	--	300
0.490 - 1.705	63.7/F (kHz)	--	30
1.705 - 30.0	0.08	-22	30
Frequency	Field strength of spurious emissions		Measurement distance
(MHz)	(µV/m)	dB(µV/m)	(metres)
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

The requirements are **FULFILLED.**

Remarks: Measurement has been performed up to 1000 MHz

For simultaneous transmission no additional emissions were detected.

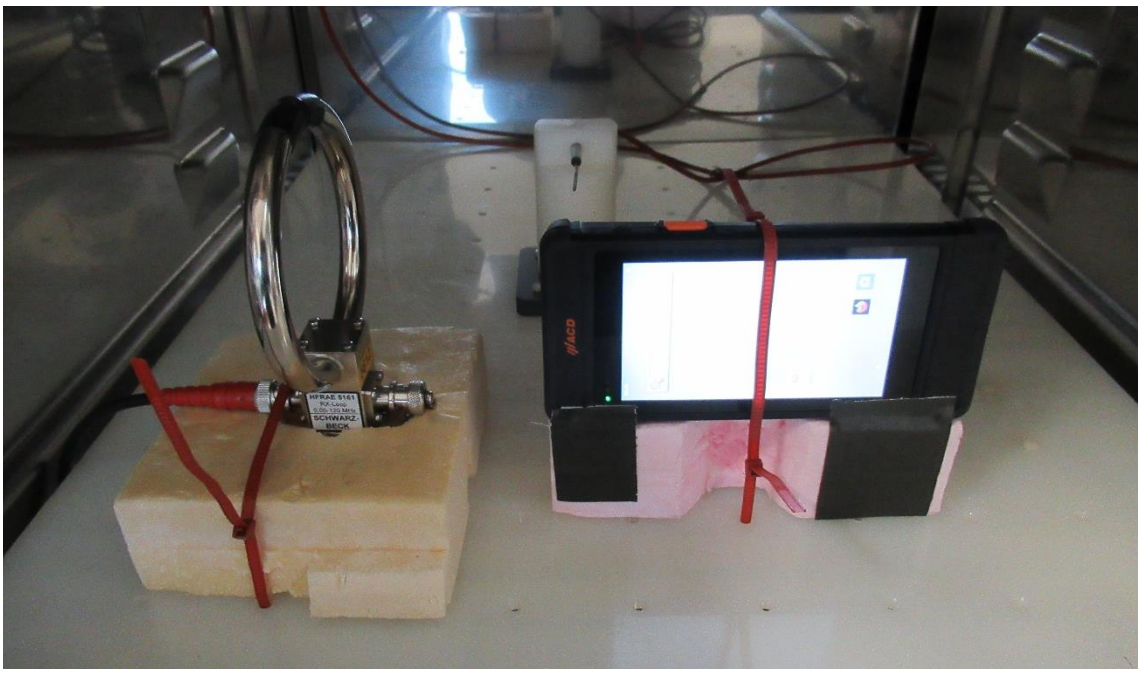
5.4 Frequency tolerance

For test instruments and accessories used see section 6 Part **FE**.

5.4.1 Description of the test location

Test location: AREA4 (Climatic Chamber)

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15, Section 15.225(e) and RSS-210 clause B.6

5.4.4 Test result

Test conditions		Test result	Tolerance	Limit
		Frequency (kHz)	(kHz)	(kHz)
T_{min} (-20)°C	V_{nom} (3.8 V)	13561.720	+0.115	± 1.356
T (-10)°C	V_{nom} (3.8 V)	13561.705	+0.100	± 1.356
T (0)°C	V_{nom} (3.8 V)	13561.690	+0.085	± 1.356
T (10)°C	V_{nom} (3.8 V)	13561.635	+0.030	± 1.356
T_{nom} (20)°C	V_{nom} (3.8 V)	13561.605	±0.000	± 1.356
T (30)°C	V_{nom} (3.8 V)	13561.615	+0.010	± 1.356
T (40)°C	V_{nom} (3.8 V)	13561.280	-0.325	± 1.356
T_{max} (50)°C	V_{nom} (3.8 V)	13561.530	-0.075	± 1.356
Measurement uncertainty		± 10 Hz		

Limit Calculation:
Carrier frequency: f_c = 13.561605 MHz
Max. tolerance: ± 0.01 % of 13.561605 MHz = ± 1.356 kHz

Limit according to FCC Part 15, Section 15.225(e) and RSS-210 clause B.6:
The frequency tolerance of the carrier signal shall be maintained within ±0.01 % of the operating frequency.

The requirements are **FULFILLED.**

Remarks: No voltage variation performed because EUT has a battery pack as power supply. Measurements started at T=20°C with fully loaded battery.

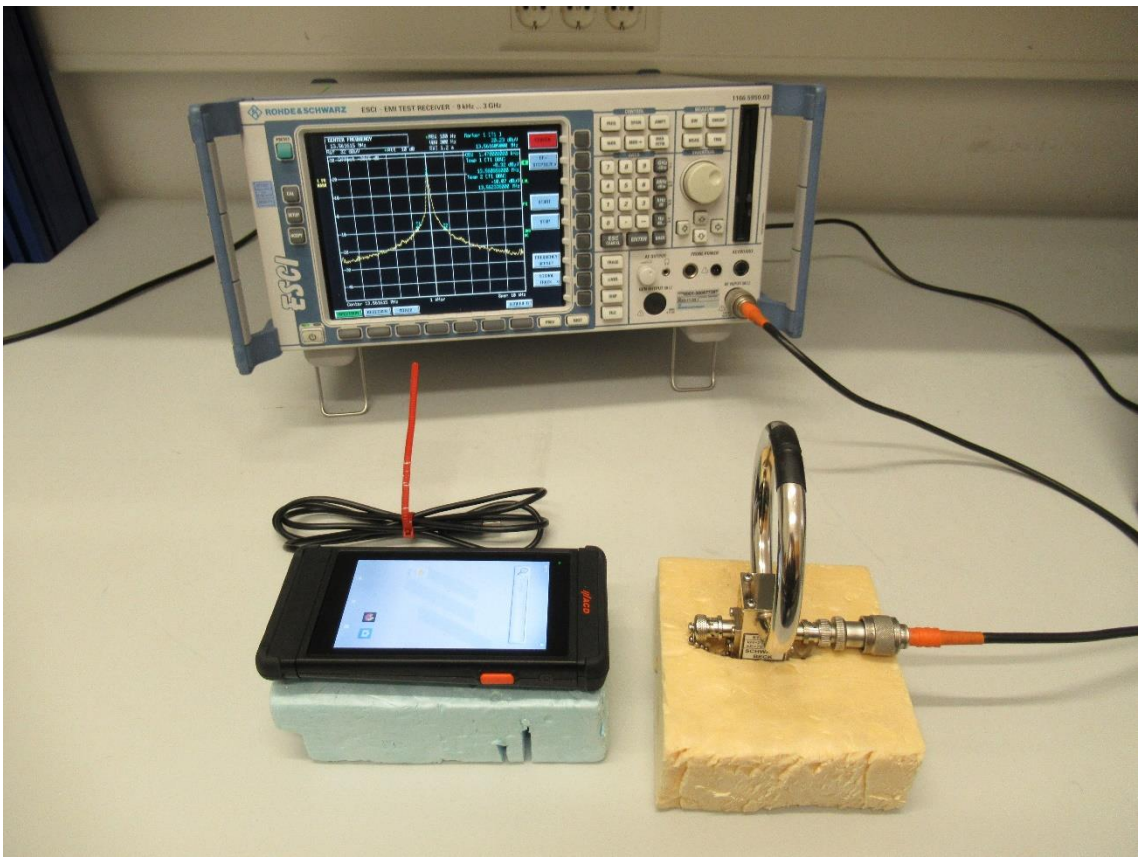
5.5 Bandwidth

For test instruments and accessories used see section 6 Part **MB**.

5.5.1 Description of the test location

Test location: Shielded Room S6

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15, Section 15.215(c) and RSS-Gen 6.7

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

5.5.4 Test result

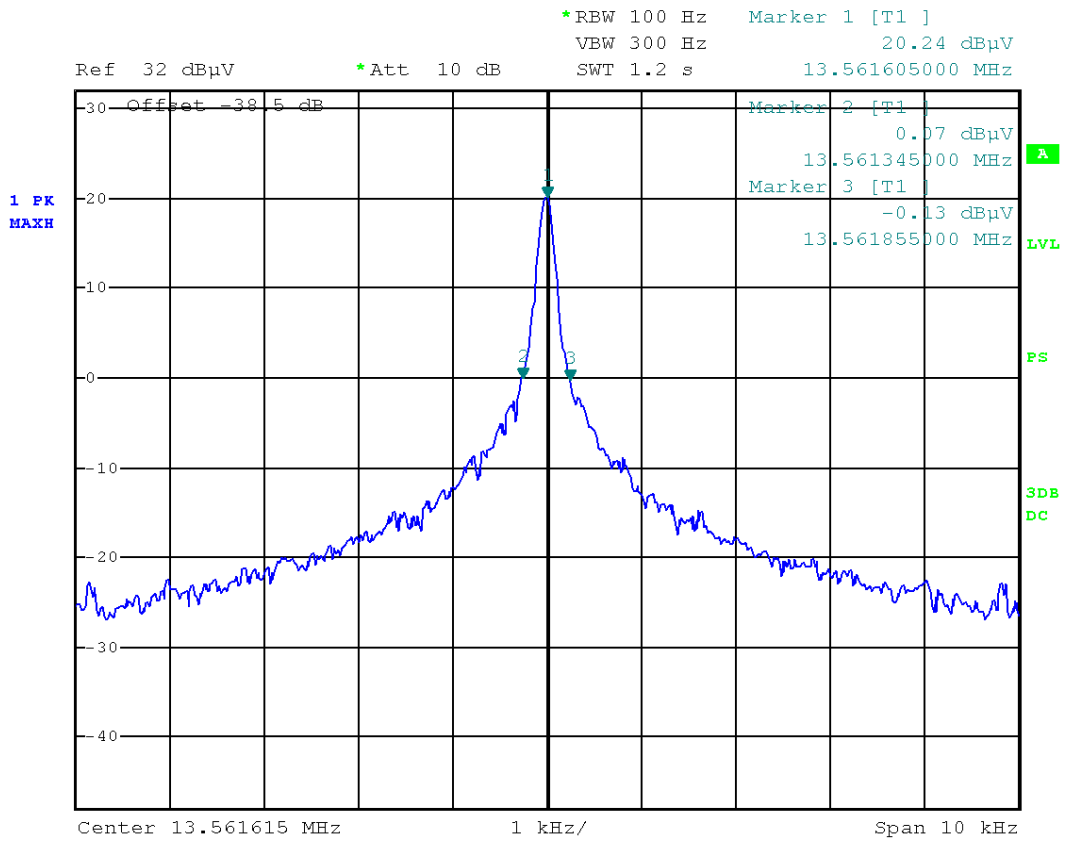
Measured Bandwidth	result (kHz)	Limit (kHz)
20dB	0.51	--
99%	1.43	--

The requirements are **FULFILLED.**

Remarks: For detailed test result please refer to following test protocol.

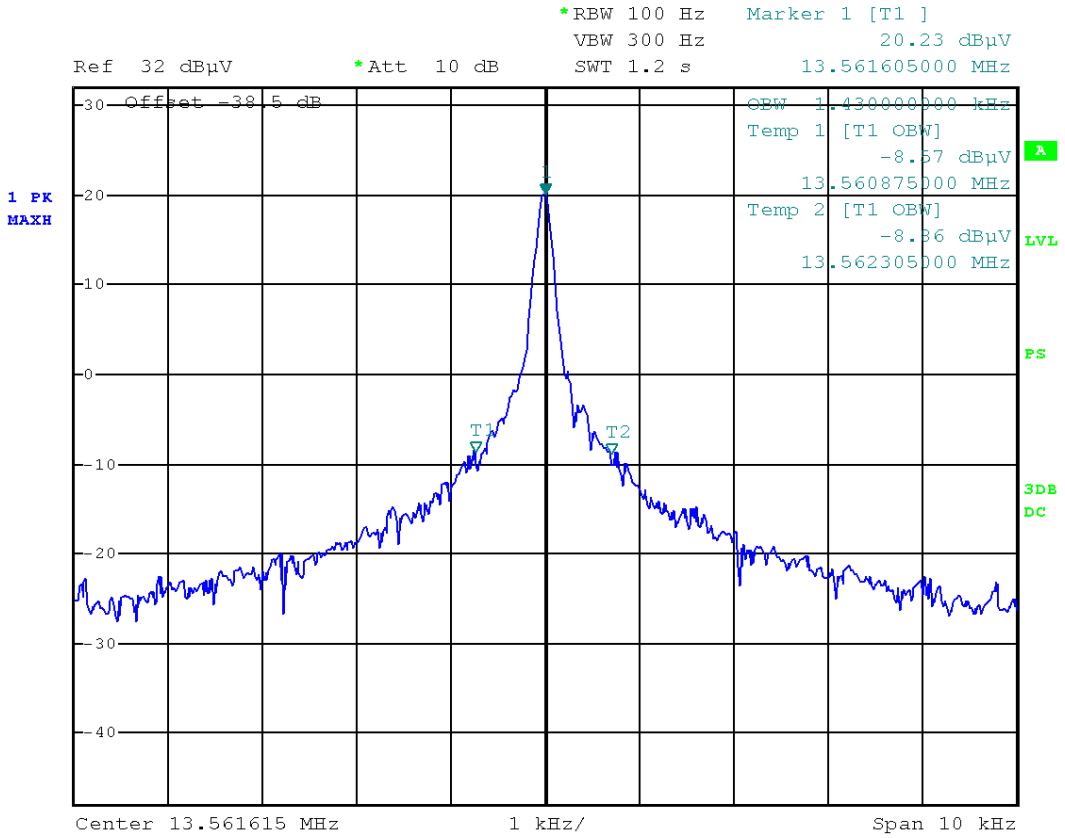
5.5.5 Test protocol

20 dB bandwidth



FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

99% Bandwidth



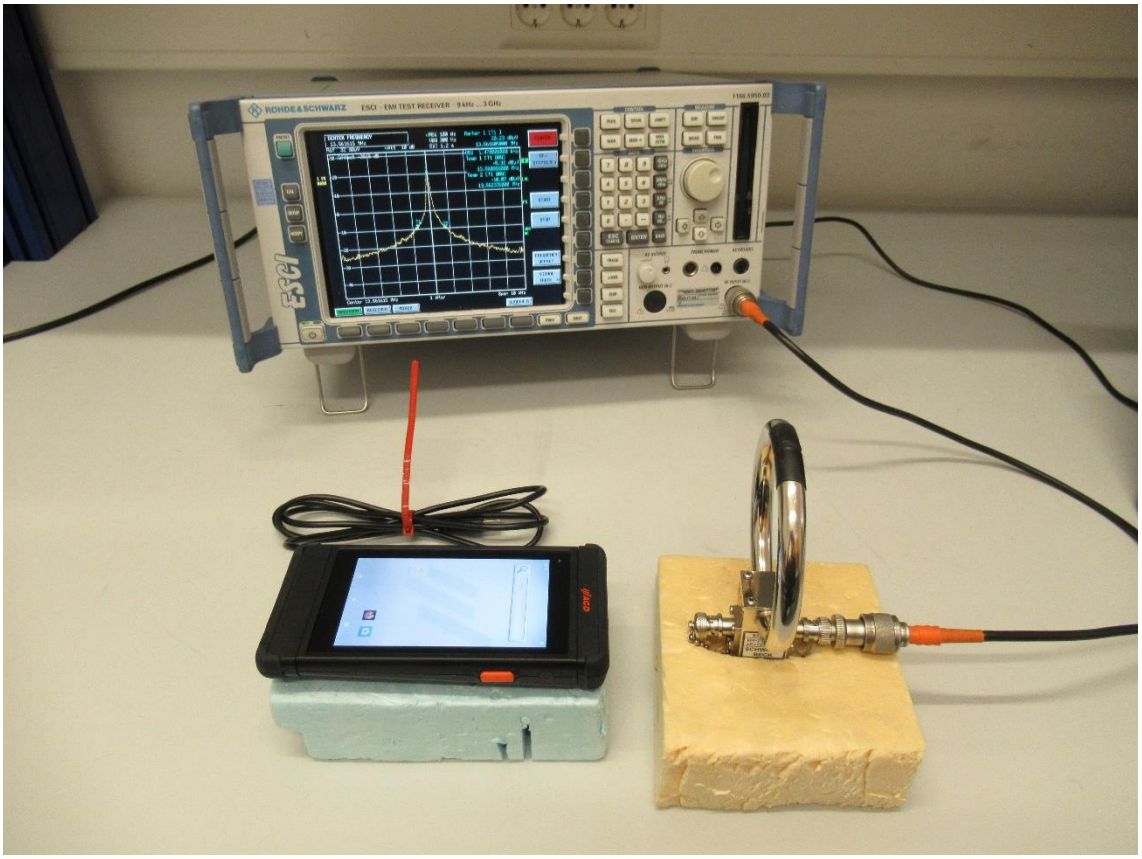
5.6 Transmitter spectrum mask

For test instruments and accessories used see section 6 Part **MB**.

5.6.1 Description of the test location

Test location: Shielded Room S6

5.6.2 Photo documentation of the test set-up



5.6.3 Applicable standard

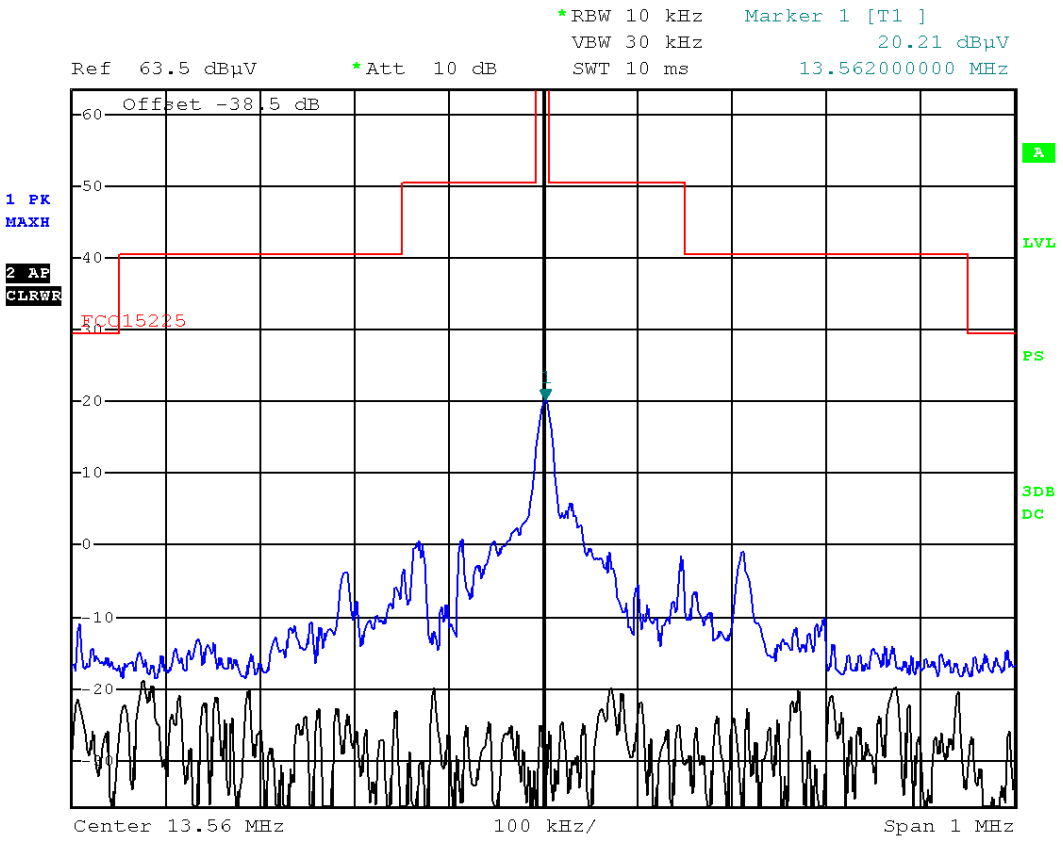
According to FCC Part 15, Section 15.225 (a-d) and RSS-210 clause B.6 (a-d)

5.6.4 Description of Measurement

Measurement was performed radiated.

FCC ID: O2FM2SMARTSE IC ID: 9137A-M2SMARTSE

5.6.5 Test result



Limits according to FCC Part 15, Section 15.225(a-d) and RSS-210 clause B.6 (a-d)

Frequency band (MHz)	Emission level limit at 30 m (µV/m)	Emission level limit at 30 m (dBµV/m)
13.110 – 13.410	106	40.5
13.410 - 13.553	334	50.5
13.553 - 13.567	15.848	84.0
13.567 – 13.710	334	50.5
13.710 – 14.010	106	40.5
outside of 13.110 – 14.010	30	29.5

The requirements are **FULFILLED.**

Remarks: None

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	BAT-EMC 3.19.1.24	01-02/68-13-001				
	ESCI	02-02/03-15-001	24/06/2021	24/06/2020		
	ESH 2 - Z 5	02-02/20-05-004	31/10/2021	31/10/2019	05/05/2021	05/11/2020
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155	13/11/2022	13/11/2019	10/05/2021	10/11/2020
	6430	02-02/50-13-014				
CPR 1	ESW26	02-02/03-17-002	30/12/2021	30/12/2020		
	HFH 2 - Z 2	02-02/24-15-001	01/04/2021	01/04/2020		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
FE	ESR 7	02-02/03-17-001	31/08/2021	31/08/2020		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
	WK-340/40	02-02/45-05-001	15/08/2021	15/08/2020		
MB	ESCI	02-02/03-05-005	24/11/2021	24/11/2020		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
SER 1	ESW26	02-02/03-17-002	30/12/2021	30/12/2020		
	HFH 2 - Z 2	02-02/24-15-001	01/04/2021	01/04/2020		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 2	ESVS 30	02-02/03-05-006	15/07/2021	15/07/2020		
	ESW26	02-02/03-17-002	30/12/2021	30/12/2020		
	VULB 9168	02-02/24-05-005	18/12/2021	18/12/2020		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				

-End of test report-