



TEST REPORT

Test Report No. : UL-RPT-RP-14086589-1116-FCC

Applicant : iSens Electrónica, Lda.
Model No. : Indexor Module 60A
FCC ID : 2A350-INDEXORMODULE
Technology : RFID 13.56 MHz
Test Standard(s) : FCC Parts 15.207, 15.209(a) & 15.225

For details of applied tests refer to test result summary

1. This test report shall not be reproduced in full or partial, without the written approval of UL International Germany GmbH.
2. The results in this report apply only to the sample tested.
3. The test results in this report are traceable to the national or international standards.
4. **Test Report Version 1.1 supersede Version 1.0 with immediate effect**
Test Report No. UL-RPT-RP-14086589-1116-FCC Version 1.1, Issue Date 14 MARCH 2022 replaces
Test Report No. UL-RPT-RP-14086589-1116-FCC Version 1.0, Issue Date 02 MARCH 2022, which is no longer valid.
5. Result of the tested sample: **PASS**

Prepared by: Sercan, Usta
Title: Laboratory Engineer
Date: 14 March 2022

Approved by: Ajit, Phadtare
Title: Lead Test Engineer
Date: 14 March 2022



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This laboratory is accredited by DAkkS.
The tests reported herein have been performed in
accordance with its' terms of accreditation.

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Table of Contents

1. Customer Information.....4
 1.1. Applicant Information 4
 1.2. Manufacturer Information 4

2. Summary of Testing.....5
 2.1. General Information 5
 Applied Standards 5
 Location 5
 Date information 5
 2.2. Summary of Test Results 6
 Note(s): 6
 2.3. Methods and Procedures 6
 2.4. Deviations from the Test Specification 6

3. Equipment Under Test (EUT)7
 3.1. Identification of Equipment Under Test (EUT) 7
 3.2. Description of EUT 7
 3.3. Modifications Incorporated in the EUT 7
 3.4. Additional Information Related to Testing 8
 3.5. Support Equipment 8
 A. Support Equipment (In-house) 8
 B. . Support Equipment (Manufacturer supplied) 8

4. Operation and Monitoring of the EUT during Testing9
 4.1. Operating Modes 9
 4.2. Configuration and Peripherals 9

5. Measurements, Examinations and Derived Results10
 5.1. General Comments 10
 5.2. Test Results 11
 5.2.1. Transmitter AC Conducted Spurious Emissions 11
 5.2.2. Transmitter 20 dB Bandwidth 17
 5.2.3. Transmitter Fundamental Field Strength & Spectrum Mask 19
 5.2.4. Transmitter Radiated Spurious Emissions 23
 5.2.5. Transmitter Frequency Stability (Temperature & Voltage Variation) 29

6. Measurement Uncertainty33

7. Used equipment.....34

8. Open-Area-Test Site comparison.....35

9. Report Revision History39

1. Customer Information

1.1.Applicant Information

Company Name:	iSens Electrónica, Lda.
Company Address:	Rua de Orlando Ribeiro no 78 4465-591 Leça do Balio, Portugal
Company Phone No.:	+351 220 198 410
Company E-Mail:	info@maksense.com
Contact Person:	André Toga
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1.2.Manufacturer Information

Company Name:	iSens Electrónica, Lda.
Company Address:	Rua de Orlando Ribeiro no 78 4465-591 Leça do Balio, Portugal
Company Phone No.:	+351 220 198 410
Company E-Mail:	info@maksense.com
Contact Person:	André Toga
Contact E-Mail Address:	Andre.toga@maksense.com
Contact Phone No.:	+351 912 575 221

2. Summary of Testing

2.1. General Information

Applied Standards

Specification Reference:	47CFR15.225
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Radio Frequency Devices) - Section 15.225
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209

Location

Location of Testing:	UL International Germany GmbH Hedelfinger Str. 61 70327 Stuttgart Germany
Test Firm Registration:	399704

Date information

Order Date:	09 November 2021
EUT arrived:	23 December 2021
Test Dates:	05 January 2022 to 01 March 2022
EUT returned:	-/-

2.2. Summary of Test Results

Clause	Measurement	Complied	Did not comply	Not performed	Not applicable
Part 15.207	Transmitter AC Conducted Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.215(c)	Transmitter 20 dB Bandwidth	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.225(a)(b)(c)(d)	Transmitter Fundamental Field Strength & Spectrum Mask	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.209(a)/15.225(d)	Transmitter Radiated Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.225(e)	Transmitter Frequency Stability (Temperature & Voltage Variation)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note(s):

2.3. Methods and Procedures

Reference:	ANSI C63.4-2014
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	KDB 414788 D01 Radiated Test Site v01r01
Title:	TEST SITES FOR RADIATED EMISSION MEASUREMENTS
Reference:	KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	maksense
Model Name or Number:	Indexor Module 60A
Serial Number:	1935710235
Hardware Version Number:	Indexor Module 60A
Firmware Version Number:	611 and 1.0.0
FCC ID:	2A35O-INDEXORMODULE

3.2. Description of EUT

The equipment under test was a Indexor Module 60A which is a Unit with sensors to detect sample tubes position. This device reads/writes from iRack RFID tag 13.56MHz technology.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Tested Technology:	RFID 13.56 MHz	
Category of Equipment:	Transceiver	
Channel Spacing:	Single channel device	
Transmit Frequency Range:	13.56 MHz	
Power Supply Type:	5 V DC via Power Over Ethernet from Mini Indexor Unit with AC/DC Switching Adaptor	
Power Supply Requirement(s):	AC/DC Switching Adaptor Input: 100~240 V @ 50~60 Hz 0.6 A Output: 5 V DC,4A 20 W Max.	
Tested Temperature Range:	Minimum	-20 °C
	Maximum	+50 °C

3.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

A. Support Equipment (In-house)

Item	Description	Brand Name	Model Name or Number	Serial Number
	-/-	-/-	-/-	-/-

B. Support Equipment (Manufacturer supplied)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Sample Rack with Passive RFID 13.56 MHz Tag	maksense	iRACK	N/A
2	Mini Indexor Unit with AC/DC Switching Adaptor	maksense	MINI INDEXOR	1921530023
3	Barcode Reader	maksense	Barcode Reader	N/A
4	AC Power Cable (1.5 m)	I-Sheng	626-6694	N/A
5	RJ45 Cable (20 cm)	VIDEK	2961-0.5BK	N/A

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Continuous transmitting modulated carrier at maximum power in RFID-13.56 MHz test mode.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- The customer supplied a document containing the setup instructions which name is “Quick Guide EMCW – iMaster + Indexor module 60A” was used.

EUT Power supply:

- The EUT was powered with 5 V DC via Power Over Ethernet by connecting a RJ45 cable from Mini Indexor Unit.
- The Mini Indexor Unit was in turn powered via AC/DC Switching Adaptor.

Test Mode Activations:

- For RFID 13.56 MHz was in test mode, after power on EUT detects iRACK's passive RFID 13.56 MHz Tag and activates the continuous communication with a modulated carrier.
- The physical RF switch on the EUT was used to select following modes:
 - 'RF ON' was used to simulate Operating Mode for transmitter test modes.

Radiated Measurements:

- As EUT is used typically in standing position to store collected blood samples.
- The EUT was tested in its typical standing position therefore this report includes relevant results.
- Radiated measurements below 30 MHz were performed with the EUT positioned on the turn table and rotating 360 degrees while the loop antenna height was set to 80 cm.
- Radiated measurements above 30 MHz were performed with the EUT positioned on the turn table and rotating 360 degrees while the antenna height varies from 1 to 4 m over the measurement frequency range.
- R&S®EMC32 Measurement Software V10.60.10 was used for the radiated spurious emission measurements.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 6 *Measurement Uncertainty* for details.

In accordance with DAkkS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Asim Shahzad	Test Date:	12 January 2022
Test Sample Serial Number:	1935710235		
Test Site Identification	SR 7/8		

FCC Reference:	Part 15.207
Test Method Used:	ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	48

Settings of the Instrument

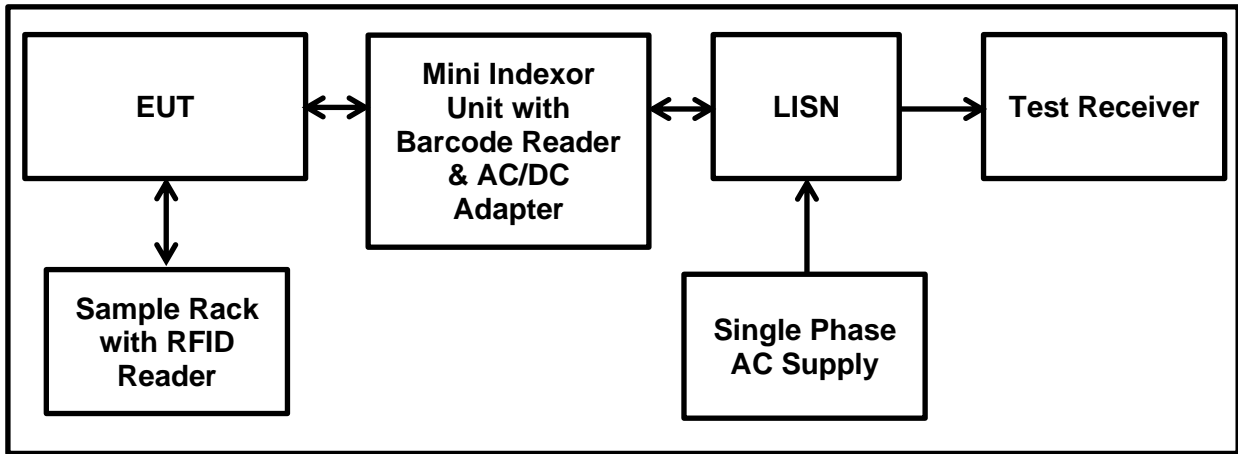
Detector	Quasi Peak/ Average Peak
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Note(s):

1. The EUT was powered with 5 V DC via Power Over Ethernet by connecting a RJ45 cable from Mini Indexor Unit. The Mini Indexor Unit was connected to 120 VAC / 60 Hz and 240 VAC / 50 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests were also performed with a 240 VAC 60 Hz single phase supply as this was within the voltage range marked on the 100-240 VAC~50/60 Hz power supply.
3. The EUT was configured on RFID 13.56 MHz: Single Channel.
4. Pre-scans were performed, and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
5. The final measured value, for the given emission, in the table below incorporates the cable loss.
6. All other emissions shown on the pre-scan plot were investigated. Only the highest 6 emissions have been reported in the tables below in accordance with ANSI C63.10 section 6.2.5.
7. Measurements were performed in shielded room (SR7/ 8 Asset Number 1603671). The EUT was placed at a height of 80 cm above the reference ground plane and in a distance of 40 cm from the vertical ground plane at the edge of the table.
8. Measurement software used: Toyo EMI Software; CE measurement software EP5/CE Ver 4.0.1.

Transmitter AC Conducted Spurious Emissions (continued)

Test setup:



Transmitter AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.1580	Live	47.8	65.6	17.8	Complied
0.1749	Live	46.5	64.7	18.2	Complied
0.2025	Live	41.6	63.5	21.9	Complied
0.4406	Live	28.1	57.1	29.0	Complied
13.5594	Live	44.1	60.0	15.9	Complied
15.9897	Live	33.8	60.0	26.2	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.1580	Live	29.1	55.6	26.5	Complied
0.1749	Live	30.0	54.7	24.7	Complied
0.2025	Live	27.9	53.5	25.6	Complied
0.4406	Live	21.2	47.1	25.9	Complied
13.5594	Live	44.0	50.0	6.0	Complied
15.9897	Live	30.9	50.0	19.1	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.1622	Neutral	48.4	65.3	16.9	Complied
0.1777	Neutral	47.6	64.6	17.0	Complied
0.1868	Neutral	43.0	64.2	21.2	Complied
0.4683	Neutral	33.2	56.5	23.3	Complied
13.5591	Neutral	44.6	60.0	15.4	Complied
15.9899	Neutral	34.4	60.0	25.6	Complied

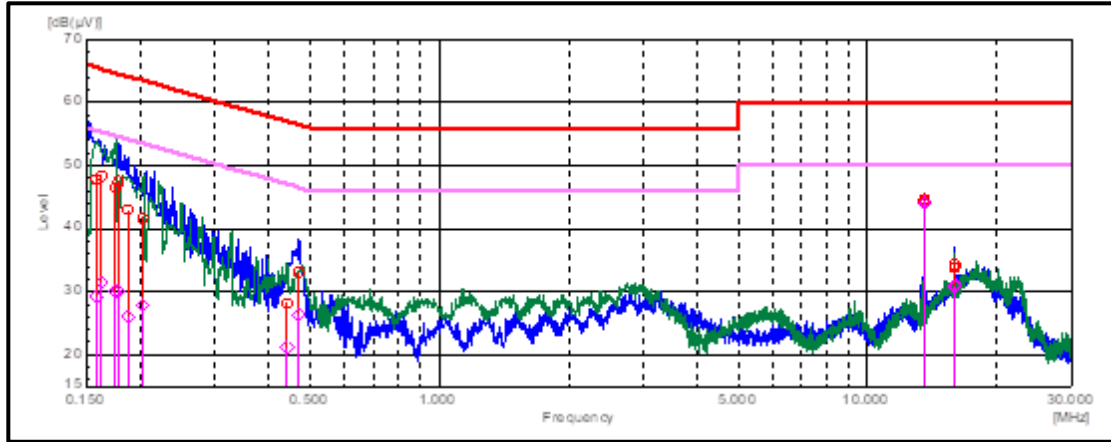
Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.1622	Neutral	31.5	55.3	23.8	Complied
0.1777	Neutral	30.2	54.6	24.4	Complied
0.1868	Neutral	26.0	54.2	28.2	Complied
0.4683	Neutral	26.3	46.5	20.2	Complied
13.5591	Neutral	44.3	50.0	5.7	Complied
15.9899	Neutral	31.2	50.0	18.8	Complied

Result: Pass

Transmitter AC Conducted Spurious Emissions (continued)

Plot: Live and Neutral Line / 120 VAC 60 Hz



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.1621	Live	44.5	65.4	20.9	Complied
0.1921	Live	40.1	63.9	23.8	Complied
0.3217	Live	29.2	59.7	30.5	Complied
0.4835	Live	30.7	56.3	25.6	Complied
13.5598	Live	43.8	60.0	16.2	Complied
15.9904	Live	33.5	60.0	26.5	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.1621	Live	28.9	55.4	26.5	Complied
0.1921	Live	25.7	53.9	28.2	Complied
0.3217	Live	21.9	49.7	27.8	Complied
0.4835	Live	22.7	46.3	23.6	Complied
13.5598	Live	43.6	50.0	6.4	Complied
15.9904	Live	30.6	50.0	19.4	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.1684	Neutral	43.6	65.0	21.4	Complied
0.2009	Neutral	40.3	63.6	23.3	Complied
0.2266	Neutral	37.3	62.6	25.3	Complied
0.4815	Neutral	33.8	56.3	22.5	Complied
13.5598	Neutral	44.4	60.0	15.6	Complied
15.9901	Neutral	33.8	60.0	26.2	Complied

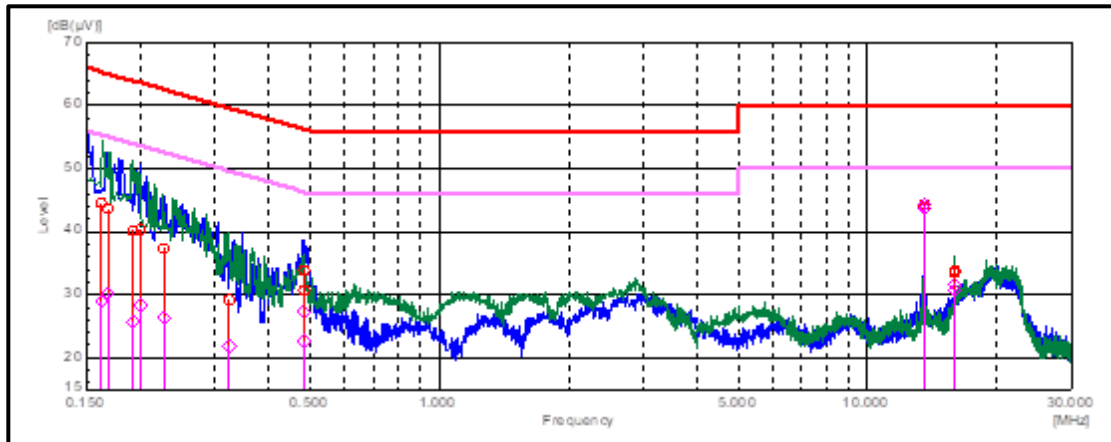
Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.1684	Neutral	30.2	55.0	24.8	Complied
0.2009	Neutral	28.3	53.6	25.3	Complied
0.2266	Neutral	26.4	52.6	26.2	Complied
0.4815	Neutral	27.3	46.3	19.0	Complied
13.5598	Neutral	44.2	50.0	5.8	Complied
15.9901	Neutral	31.4	50.0	18.6	Complied

Result: Pass

Transmitter AC Conducted Spurious Emissions (continued)

Plot: Live and Neutral Line / 240 VAC 60 Hz



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

5.2.2. Transmitter 20 dB Bandwidth

Test Summary:

Test Engineer:	Sercan, Usta	Test Dates:	01 March 2022
Test Sample Serial Number:	1935710235		
Test Site Identification	SR 9		

FCC Reference:	Part 15.215(c)
Test Method Used:	ANSI C63.10 Section 6.9.2 deviations in accordance with FCC Inquiry

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	38

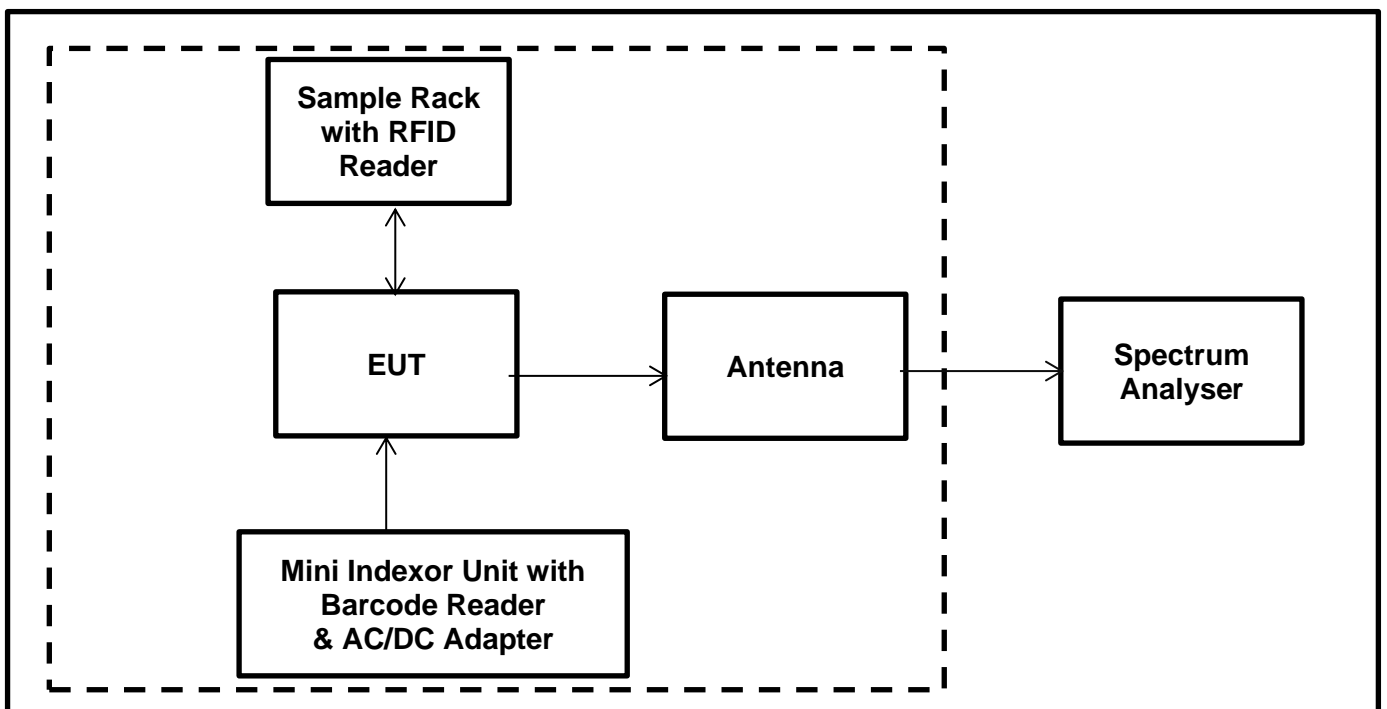
Settings of the Instrument:

RBW/VBW	500 Hz / 2 kHz
Span	5 kHz
Sweep time	Auto
Detector	MaxPeak

Notes:

- Following reasonable deviations to test method ANSI C63.10 Section 6.9.2 were made:
Larger value of RBW (>1% to 5% of the OBW) and VBW than those mentioned in ANSI C63.10 Section 6.9.2 as a result of FCC KDB and FCC inquiry respectively.
- The n dB down function of the spectrum analyzer was set to 20 dB.
- The emission shown on 20 dB Bandwidth plots show the EUT's RFID 13.56 MHz fundamental for the tested channel.

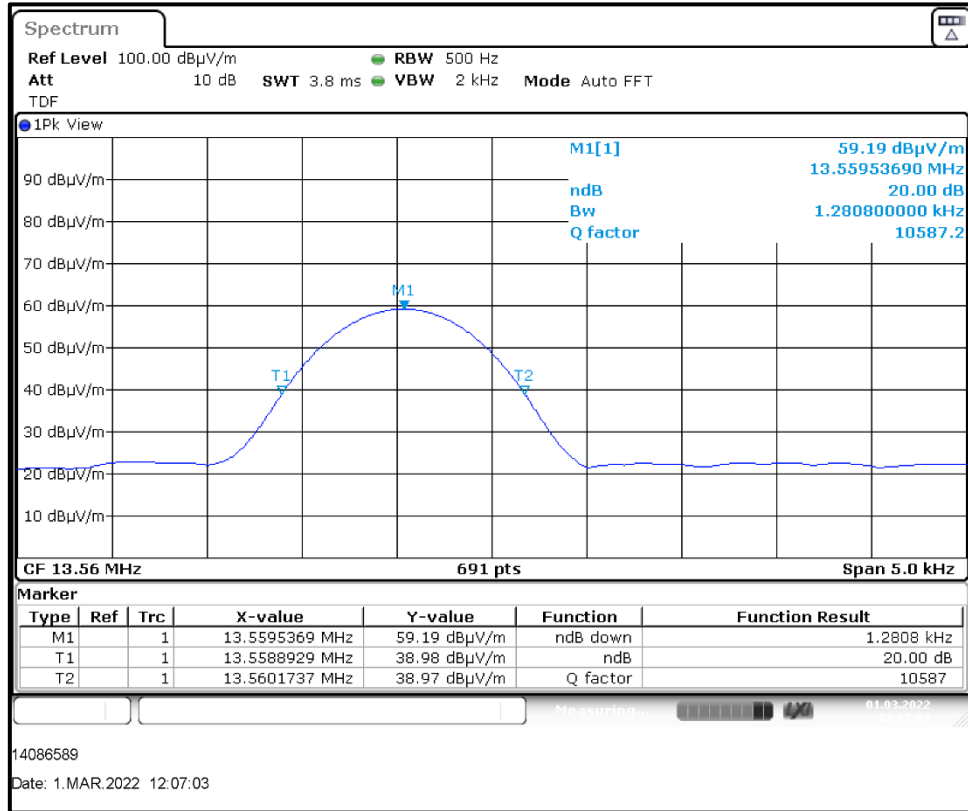
Test Setup:



Transmitter 20 dB Bandwidth (continued)

Results: Power Over Ethernet via AC-DC Power Supply / RFID 13.56 MHz

RFID Channel	20 dB Bandwidth (kHz)
13.56 MHz	1.28



RFID 13.56 MHz

Result: Pass

5.2.3. Transmitter Fundamental Field Strength & Spectrum Mask**Test Summary:**

Test Engineer:	Sercan Usta	Test Date:	5 January 2022
Test Sample Serial Number:	1935710235		
Test Site Identification	SR 1/2		

FCC Reference:	Part 15.225(a)(b)(c)(d)
Test Method Used:	ANSI C63.10 Section 6.4

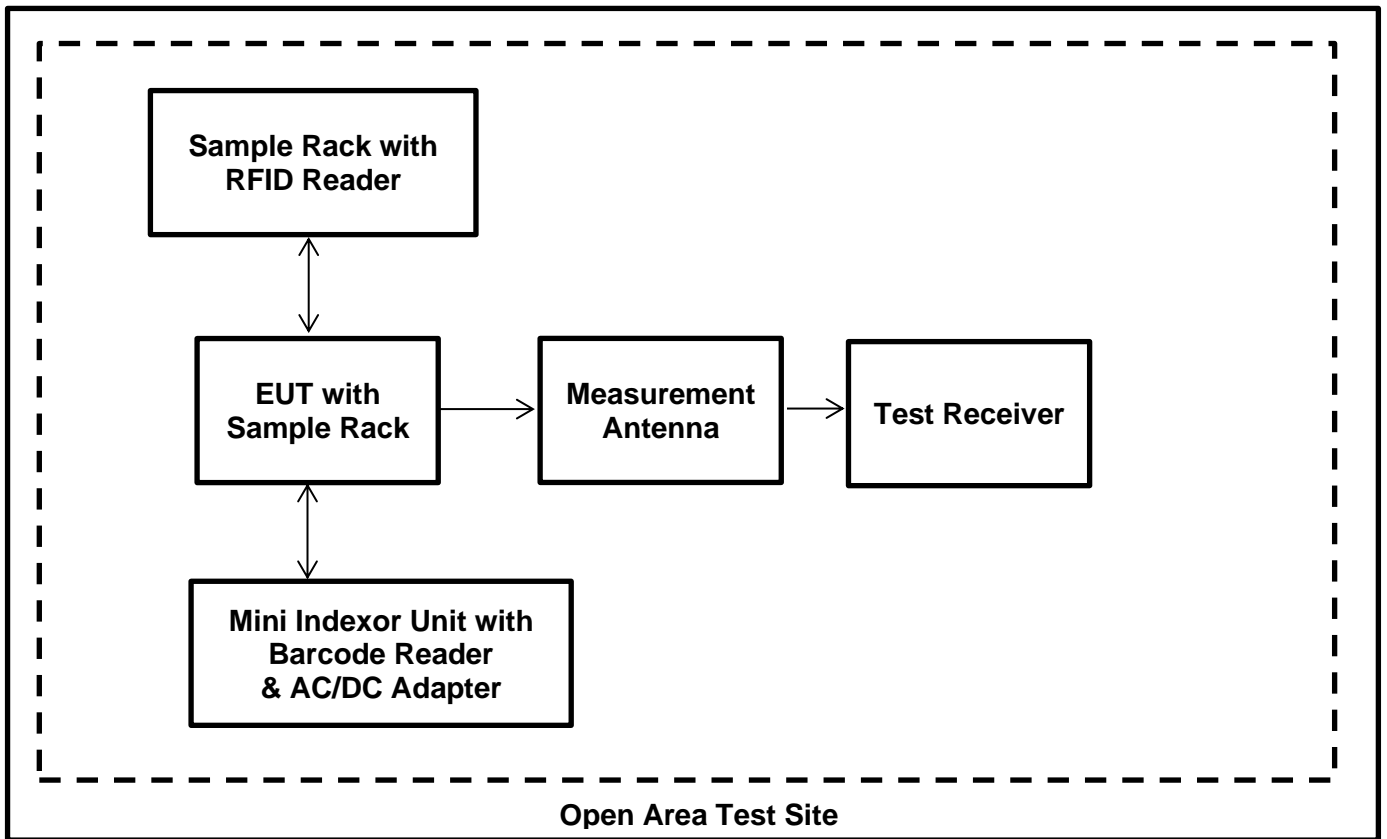
Environmental Conditions:

Temperature (°C):	24.2
Relative Humidity (%):	31.6

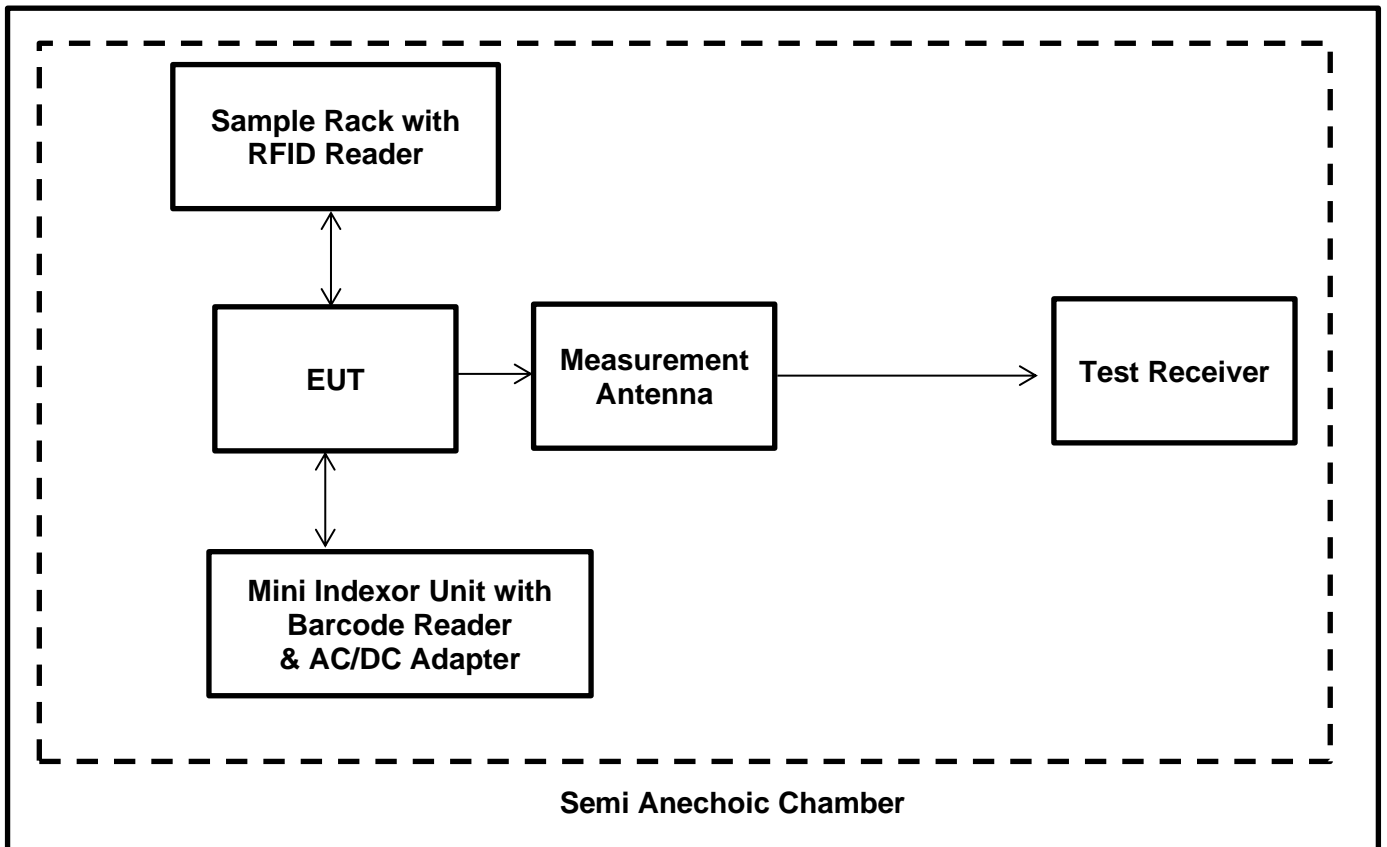
Note(s):

1. The limit is specified at a test distance of 30 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
2. In accordance with FCC KDB 414788 D01 Radiated Test Site v01 an alternative Test Site was used. Instead of an OATS a Semi Anechoic Chamber was used where evidence was shown that the behaviour is the same. A maximum deviation of 1.38 dB for 13.56 MHz could be determined. This deviation is also taken into account to the result.
3. Therefore, applicable limits were extrapolated from 30 m to 3 m using a distance extrapolation factor of 40 dB/decade. The transducer factor on the measuring instrument was used to extrapolate the measured values from 30 m to 3 m using a distance extrapolation factor of 40 dB/decade.
4. Pre-scan measurements were performed using a spectrum analyser with a peak detector and measurement bandwidth of 10 kHz. The fundamental field strength was maximized by rotating the measurement antenna and EUT. The spectrum analyser was then switched to test receiver mode and the final measurement on the maximized level was performed.
5. Compliance with the spectrum mask is shown by final measurements performed in a semi-anechoic chamber. For the field strength measurements in a semi-anechoic chamber, a transducer factor on the measuring instrument was used to extrapolate the results at 3 m to a distance of 30 m. A distance extrapolation factor of 40 dB was used.
6. A transducer factor was used on the spectrum analyser during measurement. This factor includes correction between the fixed gain of the magnetic loop antenna and the calibration values. It also includes the value of the RF cable used to connect the antenna to the spectrum analyser which was incorporated into the annual calibration of the magnetic loop antenna.
7. For the emissions appearing within the 13.110-14.010 MHz band, compliance with the spectrum mask is shown in accordance with FCC Part 15.225(a)(b)(c)(d) limits.
8. The emissions shown at frequencies approximately at 13.56 MHz on the plot represent EUT's fundamental field strength for RFID 13.56 MHz.
9. For the emissions appearing outside of the 13.110-14.010 MHz band, compliance with the spectrum mask is shown in accordance with FCC Part 15.225(d) referencing FCC Part 15.209 general radiated emission limits.

Transmitter Fundamental Field Strength & Spectrum Mask (continued)
Open Area Test Site



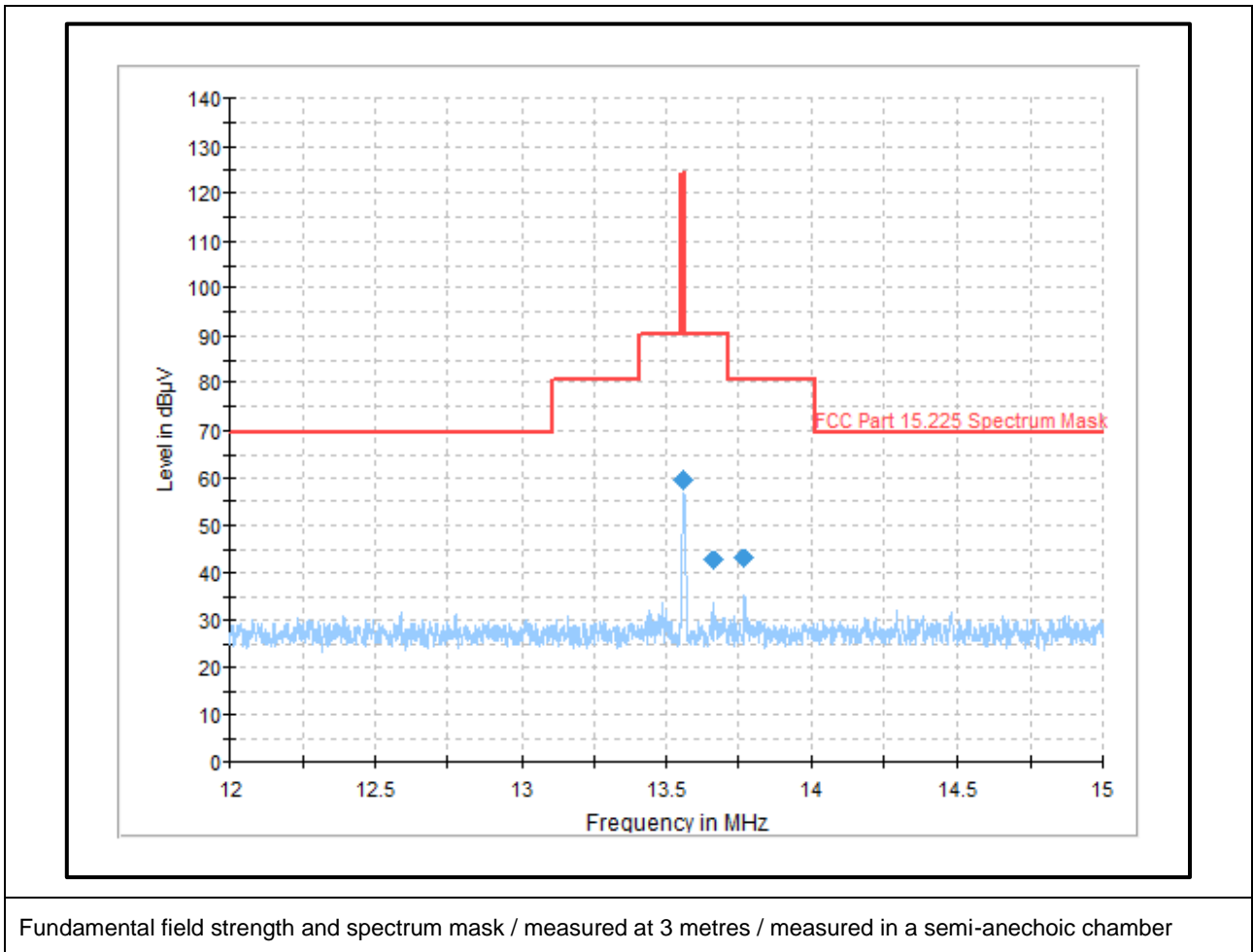
Semi Anechoic Chamber



Transmitter Fundamental Field Strength & Spectrum Mask (continued)
Results: Power Over Ethernet via AC-DC Power Supply / RFID 13.56 MHz

Frequency Band (MHz)	Emission Frequency (MHz)	Loop Antenna Orientation	MaxPeak Emission Level at 3 m (dBµV/m) <small>Note 3</small>	Deviation from OATS to SAC (dB)	Deviation Corrected Level at 3 m (dBµV/m)	Limit at 3 m (dBµV/m) <small>Note 3</small>	Margin (dB)	Result
12.000 to 13.110	All emissions were found to be below system noise floor							Complied
13.110 to 13.410	All emissions were found to be below system noise floor							Complied
13.410 to 13.553	All emissions were found to be below system noise floor							Complied
13.553 to 13.567	13.56	90° to EUT	59.60	1.38	60.98	124.0	63.02	Complied
13.567 to 13.710	13.66	90° to EUT	42.74	1.38	44.12	90.5	39.88	Complied
13.710 to 14.010	13.77	90° to EUT	42.88	1.38	44.24	80.5	36.76	Complied
14.010 to 15.000	All emissions were found to be below system noise floor							Complied

Transmitter Fundamental Field Strength & Spectrum Mask (continued)
Results: Power Over Ethernet via AC-DC Power Supply / RFID 13.56 MHz



Result: Pass

5.2.4. Transmitter Radiated Spurious Emissions**Test Summary:**

Test Engineer:	Sercan Usta	Test Date:	5 January 2022
Test Sample Serial Number:	1935710235		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.225(d) & 15.209(a)
Test Method Used:	ANSI C63.10:2013 Sections 6.3 and 6.4
Frequency Range:	9 kHz to 30 MHz

Environmental Conditions:

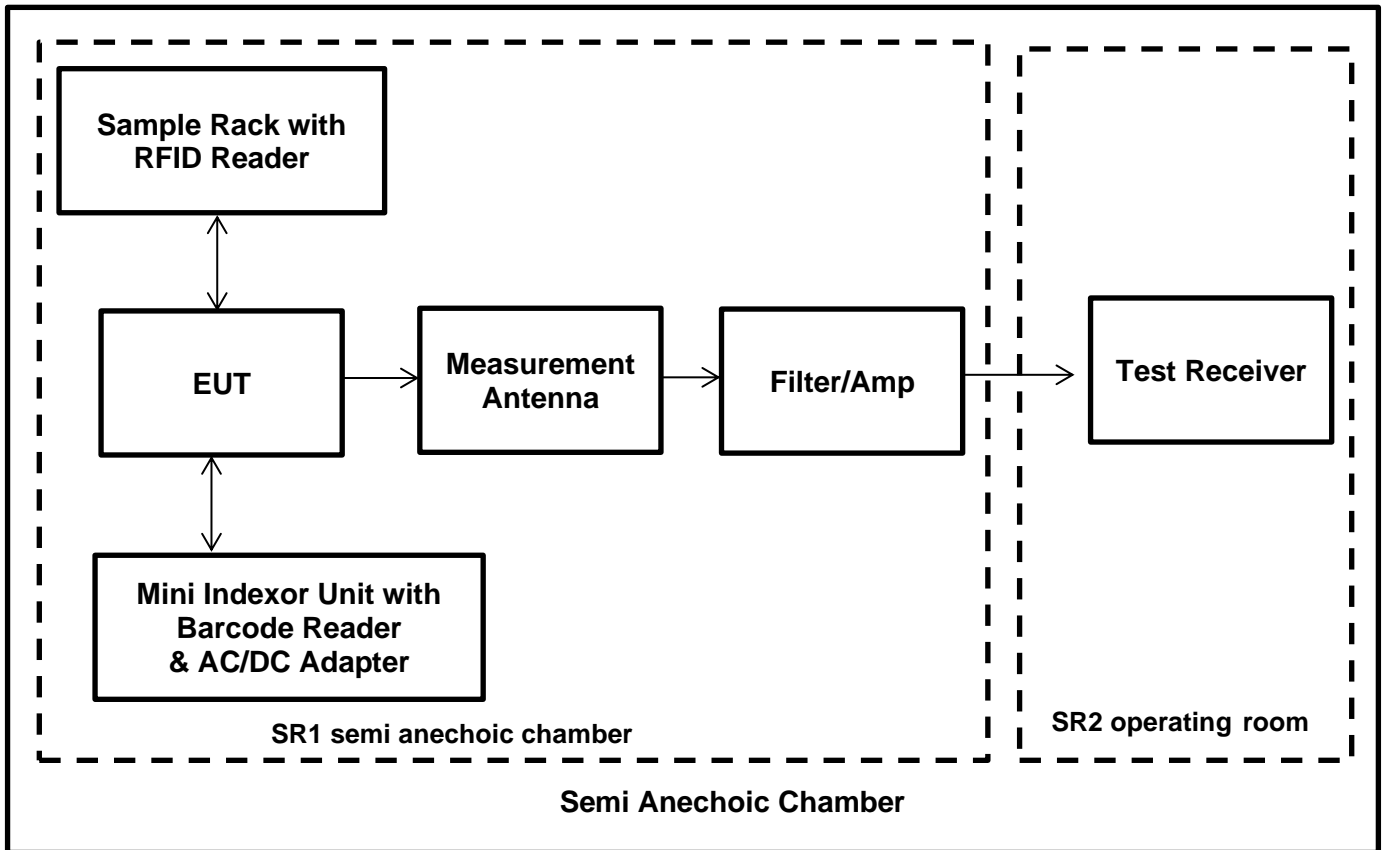
Temperature (°C):	24.2
Relative Humidity (%):	31.6

Note(s):

- In accordance with FCC KDB 414788, an alternative test site may be used for the measurement below 30 MHz (The OATS / SAC comparison data is available upon request). Therefore the result from the semi-anechoic chamber tests is shown in this section of the test report.
- The limits are specified at a test distance of 30 m & 300 m. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor.
- Therefore the limit values are extrapolated to a measurement distance of 3 m.
 - 9 kHz- 490 kHz: limits extrapolated from 300 m to 3 m adding 80 dB at 40 dB /decade.
 - 490 kHz-1705 kHz: limits extrapolated from 30 m to 3 m by adding 40 dB at 40 dB /decade.
- All emissions shown on the pre-scan plots were investigated and found to be ambient or > 20 dB below the appropriate limit.
- Measurements below 30 MHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. The measurement loop antenna height was 1 m.
- Pre-scans were performed and markers placed on the highest measured levels. The test receiver was set to:
 - Frequency range: 9 kHz-150 kHz : RBW: 300 Hz /VBW: 1 kHz
 - Frequency range: 150 kHz – 30 MHz: RBW: 10 kHz /VBW: 30 kHz
 - Detector: Max-Peak detector
 - Trace Mode: Max Hold
- The emissions shown at frequencies approximately 13.56 MHz on the 9 kHz to 30 MHz plots are the EUT RFID 13.56 MHz fundamental for the tested channel.

Transmitter Radiated Spurious Emission test setup

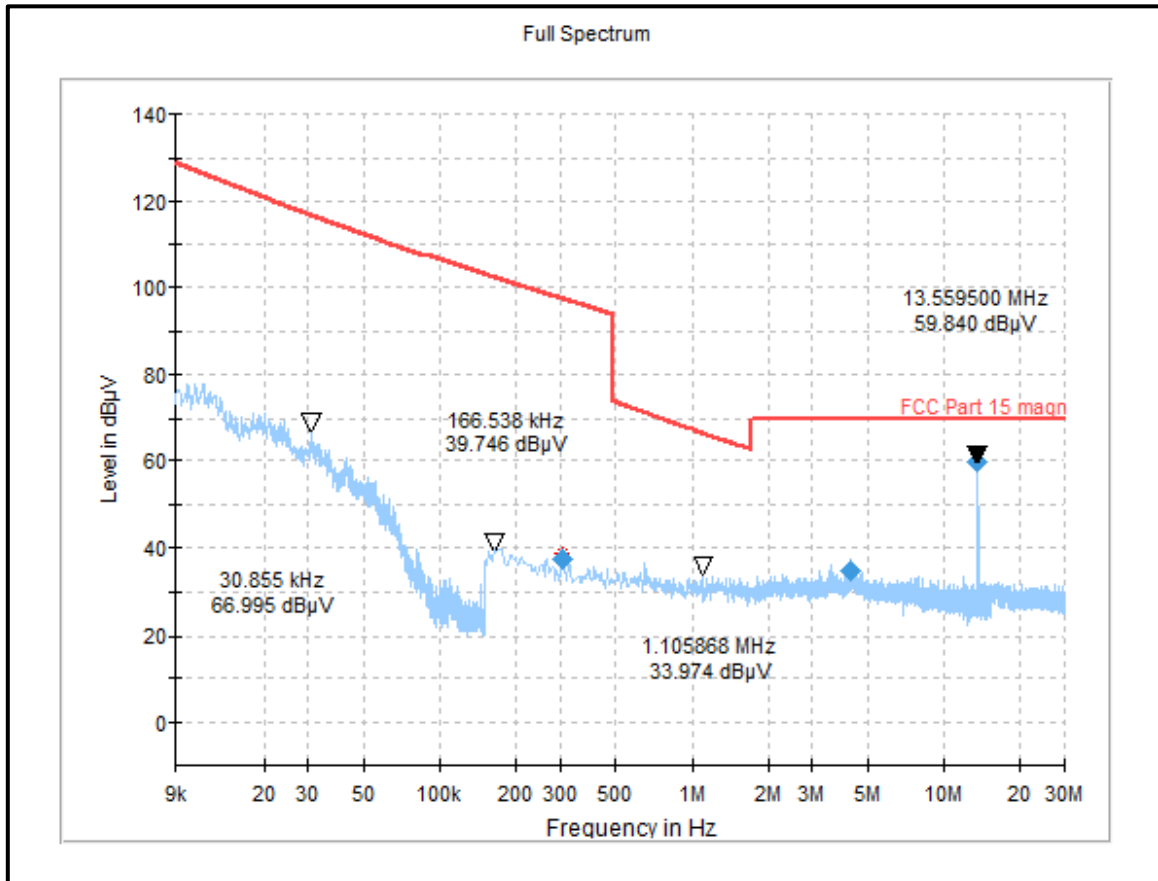
Test Setup:



Transmitter Radiated Emissions (continued)

Results: Power Over Ethernet via AC-DC Power Supply / RFID 13.56 MHz

Frequency (MHz)	Antenna Polarization	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
No critical spurious emissions were found					



Result: Pass

Transmitter Radiated Emissions (continued)**Test Summary:**

Test Engineer:	Sercan Usta	Test Date:	5 January 2022
Test Sample Serial Number:	1935710235		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.225(d) & 15.209(a)
Test Method Used:	ANSI C63.10:2013 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

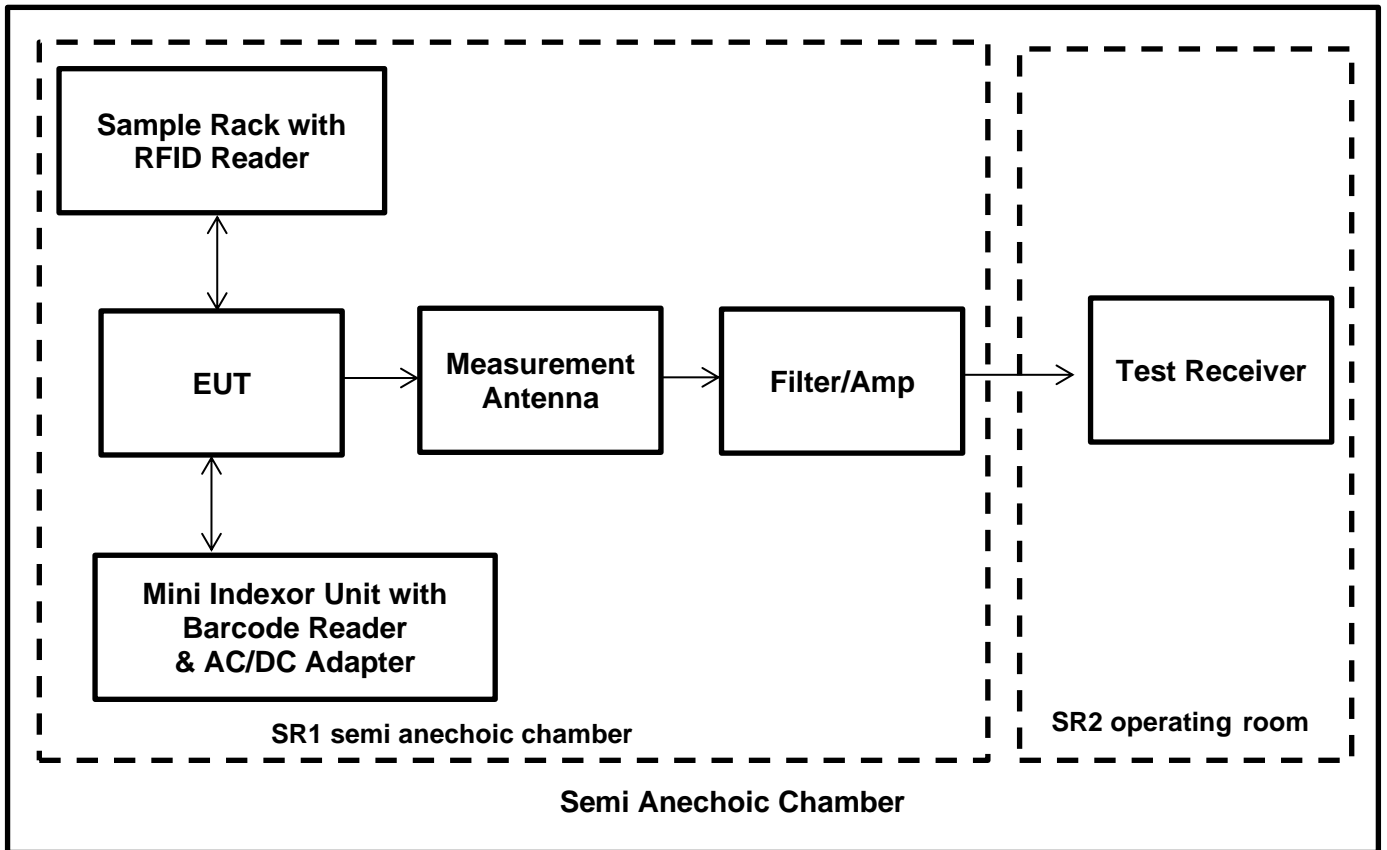
Temperature (°C):	24.2
Relative Humidity (%):	31.6

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scan plots were investigated and found to be ambient or > 20 dB below the appropriate limit.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 m to 4 m.
4. Pre-scans were performed, and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.

Transmitter Radiated Emissions (continued)

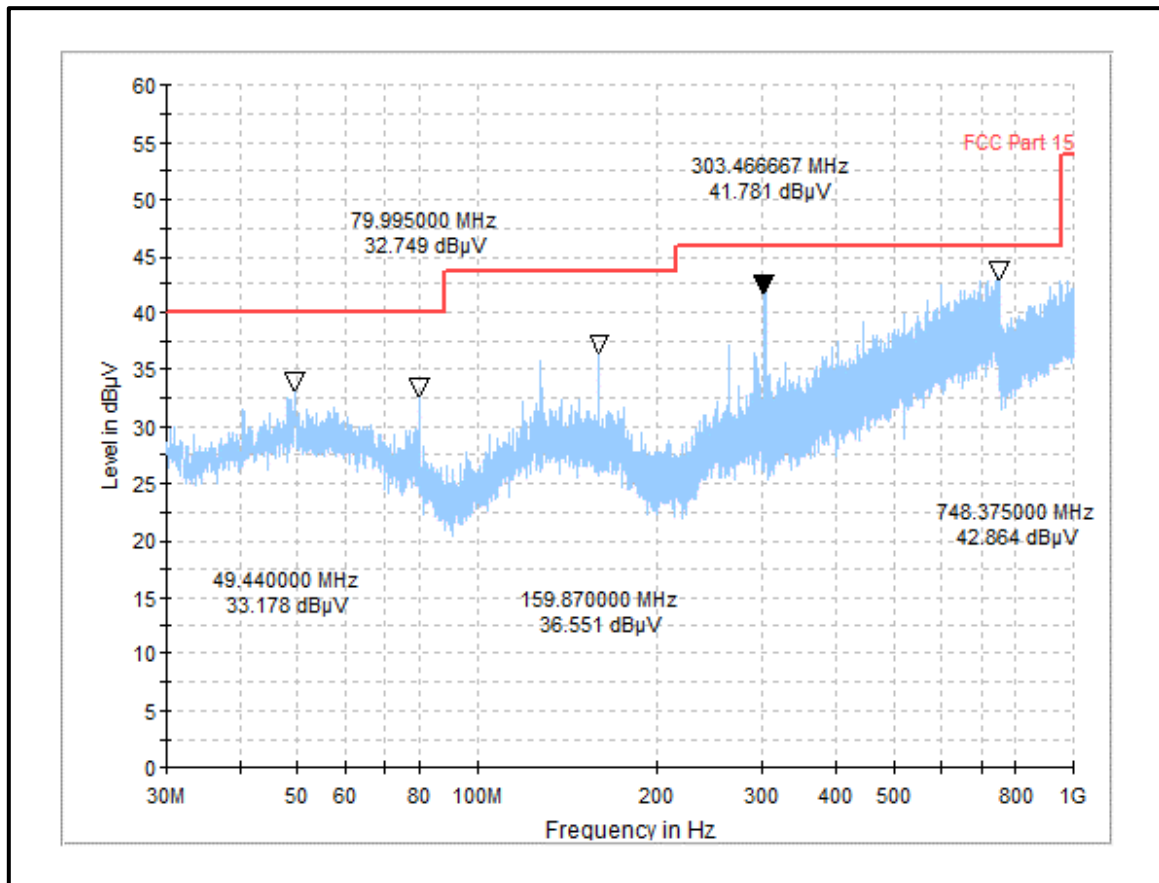
Test Setup:



Transmitter Radiated Emissions (continued)

Results: Power Over Ethernet via AC-DC Power Supply / RFID 13.56 MHz

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
303.46	Vertical	41.78	46.00	4.22	Complied



Result: Pass

5.2.5. Transmitter Frequency Stability (Temperature & Voltage Variation)**Test Summary:**

Test Engineer:	Sercan Usta	Test Dates:	11 & 12 January 2022
Test Sample Serial Number:	1935710235		
Test Site Identification	SR 9		

FCC Reference:	Part 15.225(e)
Test Method Used:	ANSI C63.10 Sections 6.8.1 and 6.8.2

Environmental Conditions:

Ambient Temperature (°C):	26 to 27
Ambient Relative Humidity (%):	30 to 32

Settings of the Instrument

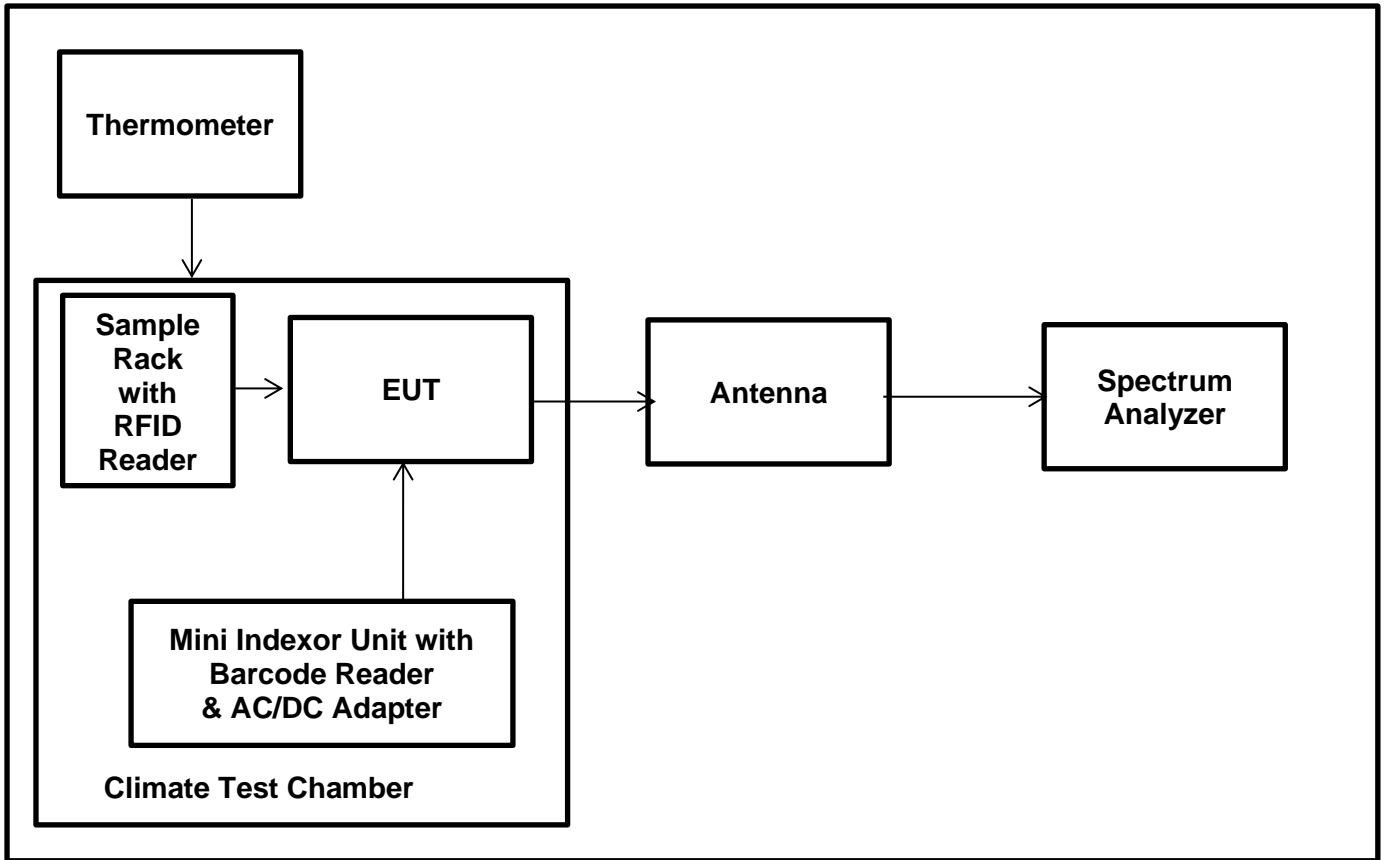
RBW/VBW	30 Hz/30 kHz
Span	4 kHz
Sweep Time	Auto
Sweep Mode	Single Sweep
Detector	Peak
Marker Function	Signal Count

Note(s):

- The EUT was kept inside the environmental/climatic test chamber. The tests were performed with extreme temperature & extreme voltage variations.
- The temperature variations were monitored throughout the tests using a calibrated digital thermometer. The voltage variations were monitored throughout the tests using a calibrated digital multimeter.
- For accurate measurement of frequency deviations, Signal Count / frequency counter function was activated on the spectrum analyser.
- The applicant's declared operating frequency 13.560 MHz was used as reference frequency.
- The difference between operating /reference frequency & measured frequency was reported as a frequency error.
- The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ or 100 ppm of the operating frequency.
- As EUT is operated with AC/DC power adapter; the frequency stability measurements when varying supply voltage were performed with following supply voltages:
 - EUT powered via AC/DC power adapter:
 - with nominal AC voltage (120 VAC /60 Hz)
 - 85% of the nominal supply AC voltage (102 VAC /60 Hz)
 - 115% of the nominal supply AC voltage (138 VAC /60 Hz)

Transmitter Frequency Stability (Temperature & Voltage Variation) (continued)

Transmitter Frequency Stability Emissions test setup for temperature variations



Transmitter Frequency Stability (Temperature & Voltage Variation) (continued)

Results: PowerOverEthernetvia AC-DC PowerSupply/RFID13.56 MHz/Temperature Variations

Extreme Temperature (°C)	Time after EUT Power-up	Measured Frequency (MHz)	Frequency Error		Frequency Error Limits		Result
			%	ppm	%	ppm	
-20	at 0 minutes	13.559547966	-0.003333584	-33.34	± 0.01	± 100	Complied
	at 2 minutes	13.559546961	-0.003340996	-33.41	± 0.01	± 100	Complied
	at 5 minutes	13.559546620	-0.00334351	-33.44	± 0.01	± 100	Complied
	at 10 minutes	13.559546959	-0.00334101	-33.41	± 0.01	± 100	Complied
-10	at 0 minutes	13.559585106	-0.00305969	-30.60	± 0.01	± 100	Complied
	at 2 minutes	13.559583787	-0.003069417	-30.69	± 0.01	± 100	Complied
	at 5 minutes	13.559580871	-0.003090922	-30.91	± 0.01	± 100	Complied
	at 10 minutes	13.559578087	-0.003111453	-31.11	± 0.01	± 100	Complied
0	at 0 minutes	13.559581552	-0.0030859	-30.86	± 0.01	± 100	Complied
	at 2 minutes	13.559583739	-0.003069771	-30.70	± 0.01	± 100	Complied
	at 5 minutes	13.559584715	-0.003062574	-30.63	± 0.01	± 100	Complied
	at 10 minutes	13.559585007	-0.00306042	-30.60	± 0.01	± 100	Complied
+10	at 0 minutes	13.559578394	-0.003109189	-31.09	± 0.01	± 100	Complied
	at 2 minutes	13.559577428	-0.003116313	-31.16	± 0.01	± 100	Complied
	at 5 minutes	13.559577007	-0.003119417	-31.19	± 0.01	± 100	Complied
	at 10 minutes	13.559576417	-0.003123768	-31.24	± 0.01	± 100	Complied
+20	at 0 minutes	13.559542081	-0.003376984	-33.77	± 0.01	± 100	Complied
	at 2 minutes	13.559548462	-0.003329926	-33.30	± 0.01	± 100	Complied
	at 5 minutes	13.559555858	-0.003275383	-32.75	± 0.01	± 100	Complied
	at 10 minutes	13.559556571	-0.003270125	-32.70	± 0.01	± 100	Complied
+30	at 0 minutes	13.559543527	-0.00336632	-33.66	± 0.01	± 100	Complied
	at 2 minutes	13.559540912	-0.003385605	-33.86	± 0.01	± 100	Complied
	at 5 minutes	13.559537164	-0.003413245	-34.13	± 0.01	± 100	Complied
	at 10 minutes	13.559536040	-0.003421534	-34.22	± 0.01	± 100	Complied
+40	at 0 minutes	13.559528695	-0.003475701	-34.76	± 0.01	± 100	Complied
	at 2 minutes	13.559525389	-0.003500081	-35.00	± 0.01	± 100	Complied
	at 5 minutes	13.559519155	-0.003546055	-35.46	± 0.01	± 100	Complied
	at 10 minutes	13.559519207	-0.003545671	-35.46	± 0.01	± 100	Complied
+50	at 0 minutes	13.559515530	-0.003572788	-35.73	± 0.01	± 100	Complied
	at 2 minutes	13.559515241	-0.003574919	-35.75	± 0.01	± 100	Complied
	at 5 minutes	13.559515818	-0.003570664	-35.71	± 0.01	± 100	Complied
	at 10 minutes	13.559516440	-0.003566077	-35.66	± 0.01	± 100	Complied

Result: Pass



Transmitter Frequency Stability (Temperature & Voltage Variation) (continued)

Results: Power Over Ethernet via AC-DC Power Supply / RFID 13.56 MHz / Voltage Variations

Extreme Voltage Conditions	Extreme AC Voltage (V)	Rated DC Voltage (V)	Measured Frequency (MHz)	Frequency Error		Frequency Error Limits		Result
				%	ppm	%	ppm	
85% of Rated Primary Supply Voltage	102	5	13.559543516	-0.0033664	-33.66	± 0.01	± 100	Complied
Rated Primary Supply Voltage	120	5	13.559540019	-0.0033922	-33.92	± 0.01	± 100	Complied
115% of Rated Primary Supply Voltage	138	5	13.559544214	-0.0033613	-33.61	± 0.01	± 100	Complied

Result: Pass

6. Measurement Uncertainty

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	95%	±2.49 dB
20 dB Bandwidth	95%	±0.87 %
Fundamental Field Strength	95%	±3.10 dB
Radiated Spurious Emissions	95%	±3.10 dB
Frequency Stability	95%	±92 Hz

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

7. Used equipment

Test site: SR 1/2

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
1	Rohde & Schwarz	Antenna, Loop	HFH2-Z2	831247/012	10/07/2020	36
460	Deisl	Turntable	DT 4250 S	n/a	n/a	n/a
465	Schwarzbeck	Antenna, Trilog Broadband	VULB 9168	9168-240	02/09/2020	24
587	Maturo	antenna mast, tilting	TAM 4.0-E	011/7180311	n/a	n/a
588	Maturo	Controller	NCD	029/7180311	n/a	n/a
591	Rohde & Schwarz	Receiver	ESU 40	100244/040	28/06/2021	12
608	Rohde & Schwarz	Switch Matrix	OSP 120	101227	lab verification	n/a
628	Maturo	Antenna mast	CAM 4.0-P	224/19590716	n/a	n/a
629	Maturo	Kippeinrichtung	KE 2.5-R-M	MAT002	n/a	n/a
-/	Testo	Thermo-Hygrometer	608-H1	01	lab verification	n/a
328	SPS	AC/DC power distribution system	PAS 5000	A2464 00/2 0200	lab verification	n/a
1603665	Siemens Matsushita Components	semi-anechoic chamber SR1/ 2	-/	B83117-A1421-T161	n/a	n/a

Test site: SR 9

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
625	Schwarzbeck	Antenna, H-field	HFSL 7101	109	lab verification only relative measurements	n/a
637	Rohde & Schwarz	Spectrum Analyser	FSV40	101587	13/07/2021	12
-/	Testo	Thermo-Hygrometer	608-H1	07	lab verification	n/a
645	Weiss Umwelttechnik	Climatic Chamber	LabEvent T/110/70/3	5822619794 0010	lab verification	n/a
327	SPS	AC/DC power distribution system	PAS 5000	A2464 00/1 0200	lab verification	n/a

8. Open-Area-Test Site comparison

GPS coordinates

Latitude: 48.765746, Longitude: 9.250684



Open-Area-Test Site comparison (continued)

The following listed equipment was used for the measurement:

Manufacturer	Type	Model	Frequency Range
Rohde & Schwarz	Signal generator	SML03	9 kHz – 30 MHz
Rohde & Schwarz	Receiver, EMI Test	ESIB7	20 Hz – 7 GHz
Rohde & Schwarz	Antenna, Loop	HFH2-Z2	1 kHz – 30 MHz
ETS LINDGREN	Antenna, Loop	6512	1 kHz – 30 MHz
HUBER+SUHNER	RF Cable	-/-	-/-
Elspec	BNC Cable	-/-	-/-

The transmit signal to the ETS Lindgren loop antenna is supplied by the SML signal generator.

The distance of the transmit and receive antenna was 3 m. No other distances can be achieved in SR1 so 10 m and 30 m distances are not possible. Due to this no comparison is possible.

The Results are valid for equipment which is not larger as the loop antenna which represents in the comparison the EUT.

If an EUT is bigger measurements on an OATS are needed.

The measurement was performed on the lowest frequency 9 kHz and was increased by 10 kHz Steps up to 100 kHz. Then the step size was 100 kHz up to 1000 kHz. From 1 MHz up to the last frequency of 30 MHz the step size was 1 MHz. The HFH2-Z2 loop antenna placed at 80 cm height was used as the receive antenna. The intercepted RF signal from this antenna was measured with the ESIB7 Test Receiver and the values were recorded accordingly.



Open-Area-Test Site comparison (continued)

Numeric values:

Frequency (MHz)	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.125	0.20
SR1 Measured power (dB μ V)	87.91	87.22	87.01	86.98	86.40	86.32	85.98	85.20	84.30	83.80	82.96	82.55
OATS Measured power (dB μ V)	86.22	87.42	87.50	86.49	86.01	85.39	84.32	84.29	84.20	83.10	83.60	82.32
Delta (dB)	-1.69	0.20	0.49	-0.49	-0.39	-0.93	-1.66	-0.91	-0.10	-0.70	0.64	-0.23

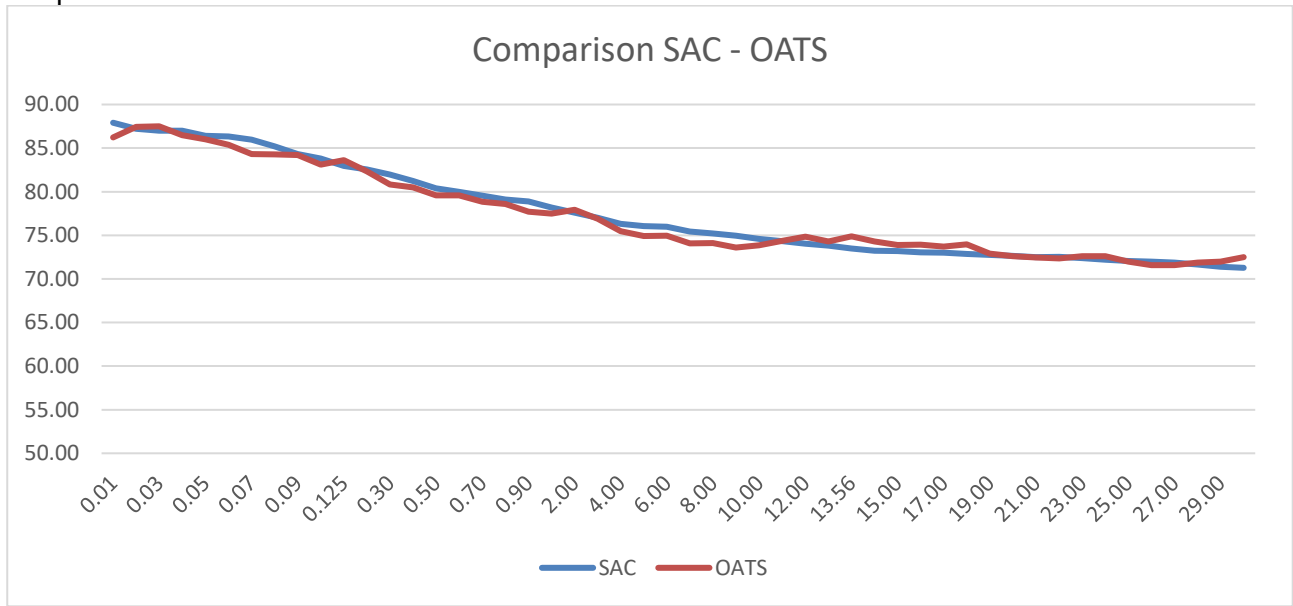
Frequency (MHz)	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	2.00	3.00	4.00	5.00
SR1 Measured power (dB μ V)	81.98	81.23	80.39	80.00	79.53	79.10	78.87	78.20	77.60	77.01	76.32	76.04
OATS Measured power (dB μ V)	80.84	80.49	79.58	79.58	78.85	78.59	77.69	77.50	77.91	76.90	75.45	74.90
Delta (dB)	-1.14	-0.74	-0.81	-0.42	-0.68	-0.51	-1.18	-0.70	0.31	-0.11	-0.87	-1.14

Frequency (MHz)	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	13.56	14.00	15.00	16.00
SR1 Measured power (dB μ V)	75.98	75.43	75.20	74.97	74.59	74.32	74.05	73.83	73.50	73.22	73.20	73.05
OATS Measured power (dB μ V)	74.94	74.09	74.11	73.58	73.87	74.38	74.84	74.31	74.88	74.29	73.90	73.93
Delta (dB)	-1.04	-1.34	-1.09	-1.39	-0.72	0.06	0.79	0.48	1.38	1.07	0.70	0.88

Frequency (MHz)	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00
SR1 Measured power (dB μ V)	73.00	72.86	72.74	72.64	72.50	72.52	72.39	72.20	72.04	71.97	71.86	71.64	71.41	71.27
OATS Measured power (dB μ V)	73.70	73.98	72.90	72.60	72.45	72.34	72.59	72.59	71.97	71.59	71.58	71.88	71.98	72.49
Delta (dB)	0.70	1.12	0.16	-0.04	-0.05	-0.18	0.20	0.39	-0.07	-0.38	-0.28	0.24	0.57	1.22

Open-Area-Test Site comparison (continued)

Graph



Conclusion: Maximum difference is 1.69 dB @ 9 kHz

9. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	39	-	Initial Version
<p>Test Report Version 1.1 supersede Version 1.0 with immediate effect Test Report No. UL-RPT-RP-14086589-1116-FCC Version 1.1, Issue Date 14 MARCH 2022 replaces Test Report No. UL-RPT-RP-14086589-1116-FCC Version 1.0, Issue Date 02 MARCH 2022, which is no longer valid.</p>			
1.1	as below	as below	Current Version
	26	5.2.4	6 dB replaced with 20 dB
	29	5.2.5	"EUT can be operated either with" replaced with "EUT is operated with"
	29	5.2.5	Power supply Type & Requirement(s) infos updated.
	12,17,20, 24,27,30	5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.5	"Mini Indexor Unit AC/DC Adaptor" replaced with "Mini Indexor Unit with Barcode Reader & AC/DC Adapter" in test setups

--END of Test Report--