

FCC and IC Test Report for Parts 15.207, 15.225 and RSS 210, RSS-Gen

Product name : WRDBK
Applicant : Salto Systems S.L
FCC ID : UKCWRDBK
IC ID : 10088A-WRDBK

Test report No. : 20153970302 Ver 2.00

Laboratory information

Accreditation

Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001

The Industry Canada registration number for the 3 meter test chamber of Telefication is: 4173A-1.

Documentation

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

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Testing Location

Test Site	Telefication BV
Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31316583180 Fax. +31316583189
Test Site FCC	NL0001

Revision History

Version	Date	Remarks	By
v0.50	12-04-2016	First draft	RvB
V1.00	17-05-2016	Release version	RvB
V2.00	20-06-2016	AC conducted emissions added	PS

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Summary of Test results

FCC	IC	Description	Paragraph	Verdict
15.225(a),(b),(c)	RSS-210 A2.6(a),(b),(c)	Field strength of emissions	3.1	Pass
--	RSS-GEN 4.6.1	99% Bandwidth	3.2	Pass
15.225(d)	RSS-210 A2.6(d)	Field strength of unwanted emissions	3.3	Pass
15.225(e)	RSS-210 A2.6(e)	Frequency Tolerance	3.4	Pass
15.207(c)	RSS-Gen § 8.8	AC conducted emissions	3.5	Pass

1 General Description

1.1 Applicant

Client name: Salto systems, S.L.
Address: C/Arkotz 9 Pol. Lanbarre, Oiartzun
Zip code: 20180
Telephone: +34 943344550
E-mail: j.gutierrez@saltosystems.com
Contact name: J. Gutierrez

1.2 Manufacturer

Manufacturer name: Salto systems, S.L.
Address: C/Arkotz 9 Pol. Lanbarre, Oiartzun
Zip code: 20180
Telephone: +34 943344550
E-mail: j.gutierrez@saltosystems.com
Contact name: J. Gutierrez

1.3 Tested Equipment Under Test (EUT)

Product name: WRDBK
Brand name: SALTO
Product type: BLE capable wall RFID card reader
FCC ID: UKCWRDBK
IC ID: 10088A-WRDBK
Model(s): WRDB,WRDBK
Software version: Special firmware for testing
Hardware version: 224824 - 221298
Date of receipt: 01-12-2015
Tests started: 09-12-2015
Testing ended: 20-06-2016

1.4 Product specifications of Equipment under test

Tx Frequency:	13.56 MHz
Rx frequency:	13.56 MHz
Antenna type and gain:	PCB loop Antenna
Type of modulation:	ASK
Emission designator:	unknown

1.5 Modification of the Equipment Under Test (EUT)

None.

1.6 Observations and remarks

The EUT has two versions: one with a keypad (WRDBK) and one without keypad (WRDB). All the test have been performed on the worst case off the 2 the WRDBK.

1.7 Environmental conditions

Test date	17-03-2016	06-04-2016	20-06-2016
Ambient temperature	24°C	20.7°C	23°C
Humidity	42.1%	38.1%	50.2%

1.8 Measurement standards

- ANSI C63.4:2014
- ANSI C63.10:2013

1.9 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC part 15 Subpart C §15.207
- FCC Part 15 Subpart C §15.225.
- RSS-210, issue 8, RSS-GEN Issue 4.

1.10 Conclusions

The sample of the product showed NO NON-COMPLIANCES to the specifications stated in paragraph 1.9 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.9 "*Applicable standards*".

All conducted tests are performed by:

Name : ing R. van Barneveld

Review of test methods and report by:

Name : ing. P.A. Suringa

The above conclusions have been verified by the following signatory:

Date : 20-06-2016

Name : ing M.T.P.M Wouters v/d Oudenweijer

Function : Director Certification

Signature :



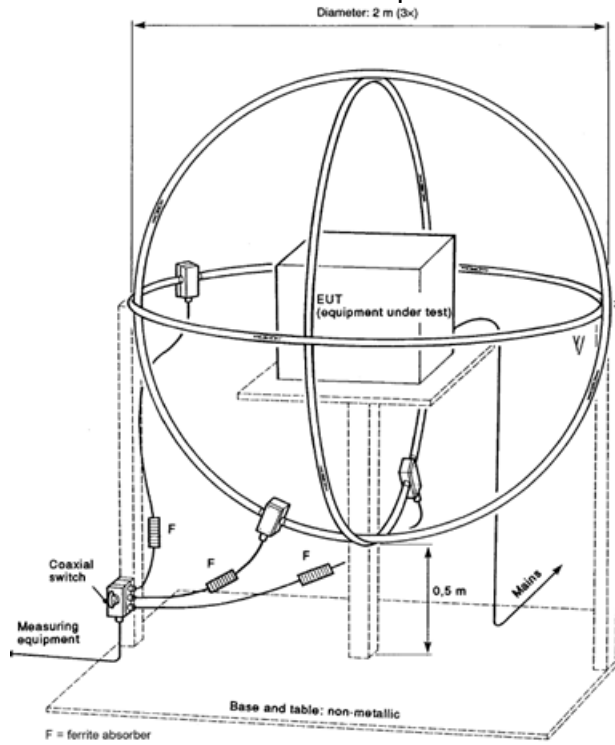
2 Test configuration of the Equipment Under Test

2.1 Test mode

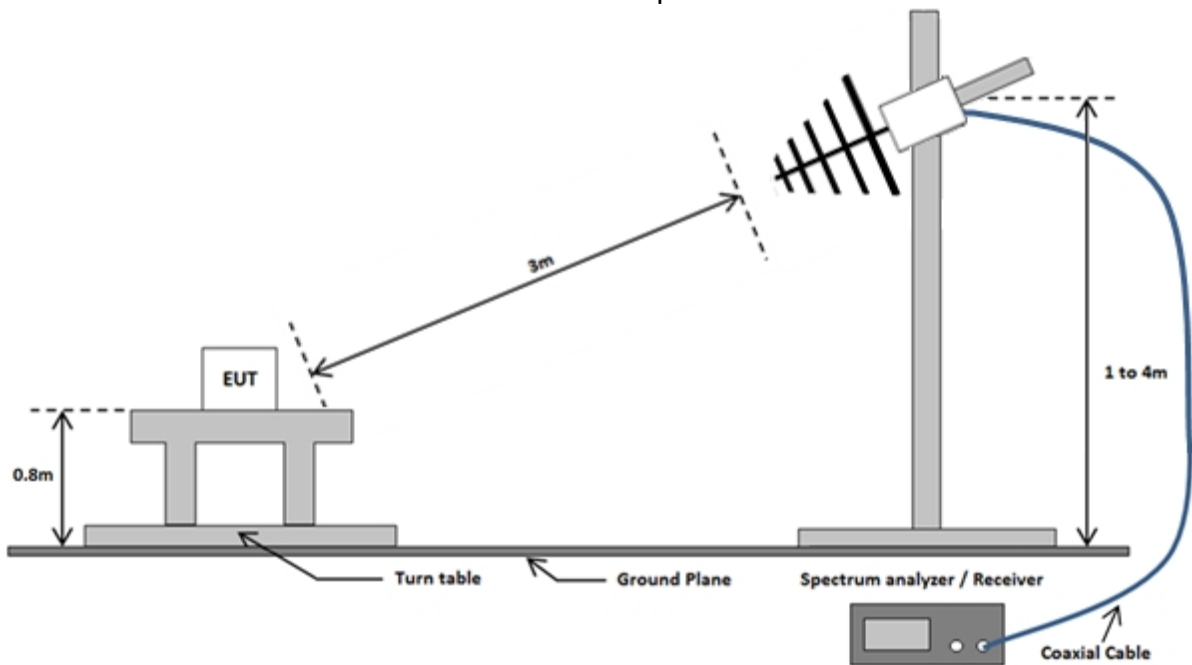
The applicant provided test mode firmware for the EUT, in which it was possible to configure the EUT to transmit continuously.

2.2 Radiated Test setup

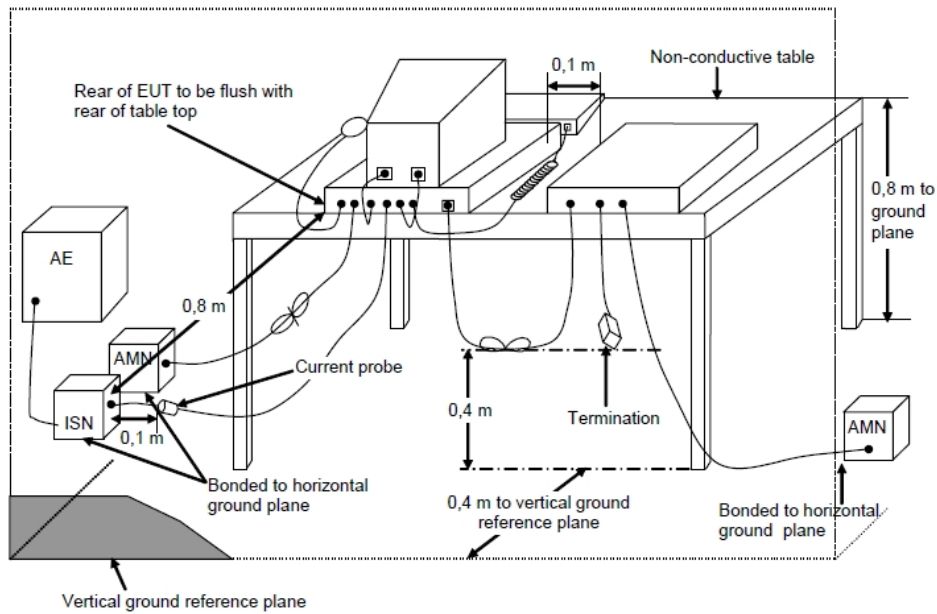
Radiated emissions test setup below 30 MHz



Radiated emissions test setup 30 MHz – 1 GHz



AC Conducted Mains Test setup



2.3 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
Spectrum Analyzer	Rohde & Schwarz	ESR7	TE01220	3.1 to 3.4
Climate Chamber	TE 00741	CTS	-40/350	3.4
Biconilog Antenna	Chase	CBL6112a	TE00967	3.3
SAC Chamber	Comtest Engineering BV	-	TE00861	3.3
Triple loop antenna	Schwarzbeck	HXYZ 9170	TE01311	3.1 and 3.2
EMI receiver	Rohde & Schwarz	ESR 7	TE01220	3.5
Artificial Mains network (AMN)	Rohde & Schwarz	ESH3-Z5	TE00208	3.5
Pulse limiter	Rohde & Schwarz	ESH3-Z2	TE00756	3.5

2.4 Sample calculations

Field Strength Measurement example:

Frequency (MHz)	Polarization	Height(m)	Peak (dB μ V/m)
67,8	Horizontal	2	23,7

The following relation applies:

$$E \text{ (dB}\mu\text{V/m)} = U \text{ (dB}\mu\text{V)} + AF \text{ (dB/m)} + CL \text{ (dB)}$$

Where:

E = Electric field strength

U = Measuring receiver voltage

AF = Antenna factor

CL = Cable loss

$$(23.7 = 15.8 + 1.1 + 6.8)$$

3 Test results

3.1 Field strength of emissions

3.1.1 Limit

15.225(a)

For The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

15.225(b)

Within the band 13.410 – 13.553 MHz and 13.567 – 13.710 MHz, the field strength of ant emissions shall not exceed 334 microvolts/meter at 30 meters.

15.225(c)

Within the band 13.110 – 13.410 MHz and 13.710 – 14.010 MHz, the field strength of ant emissions shall not exceed 106 microvolts/meter at 30 meters.

Frequency (MHz)	$\mu\text{V}/\text{m}$ at 30 meter	$\text{dB}\mu\text{V}/\text{m}$ at 30 meter	$\text{dB}\mu\text{V}/\text{m}$ at 3 meter
13.553 – 13.567	15,848	84	124
13.410 – 13.553 and 13.567 – 13.710	334	50.5	90.5
13.110 – 13.410 and 13.710 - 14.010	106	40.5	80.5

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

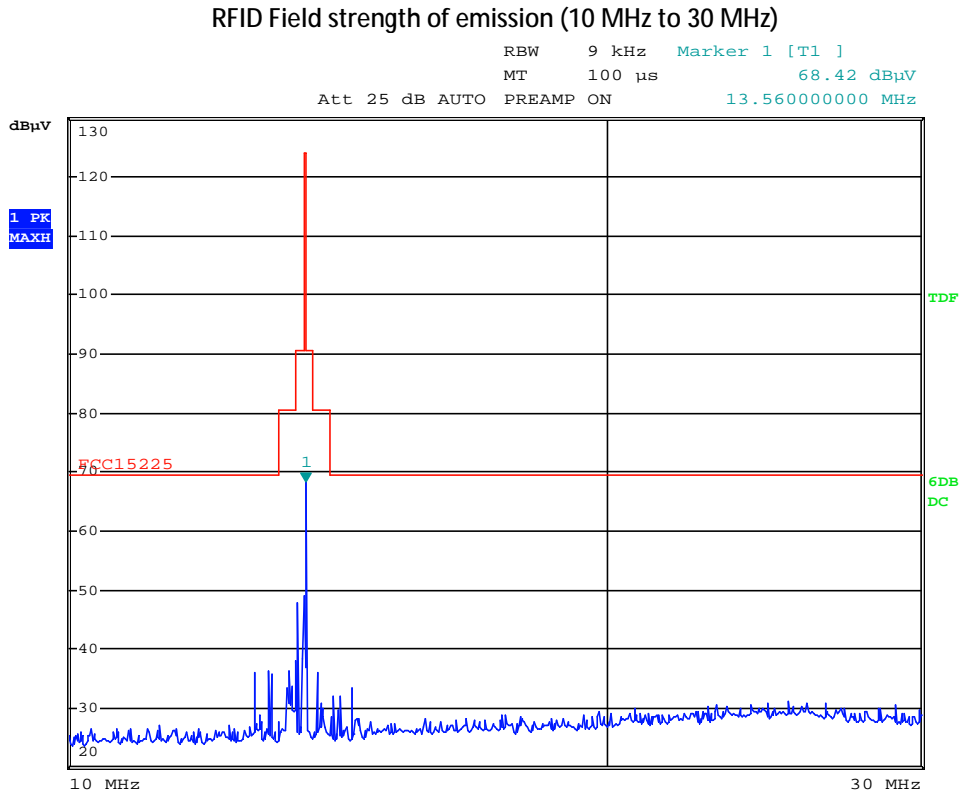
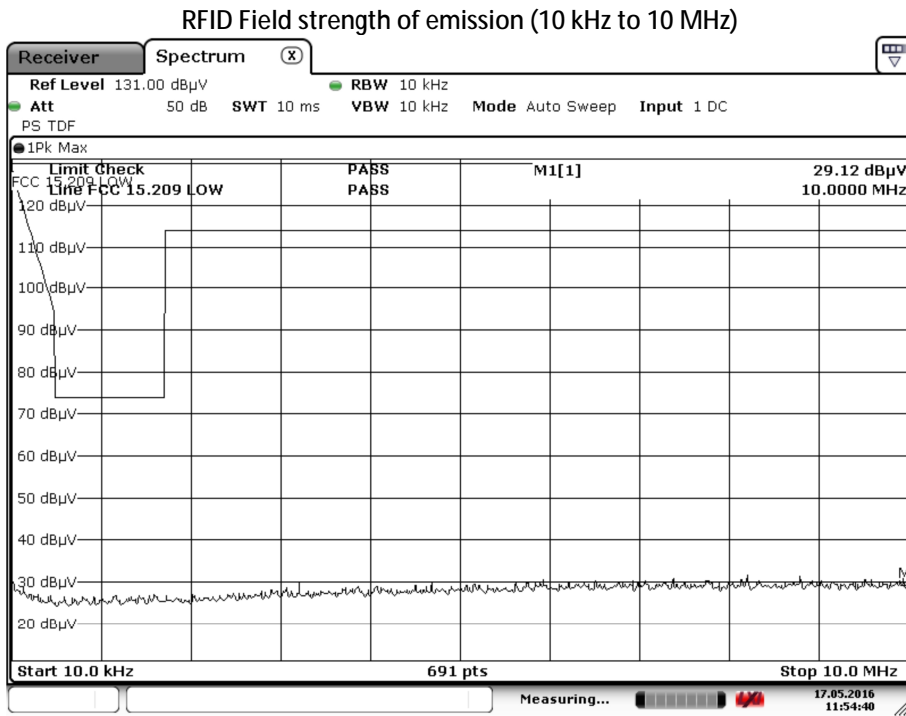
3.1.4 Test procedure

According to ANSI C63.4-2014, section 5.3 and 8.2.1

3.1.5 Test results of Field strength of emissions

Technology Std.	Frequency (MHz)	Max Field strength at 3m ($\text{dB}\mu\text{V}/\text{m}$)
RFID	13.56	68.42
Uncertainty	+3.0 / -2.5 dB	

3.1.6 Plots of Field strength of emissions Measurement



Remark: in the plot the limit is modified for an inverse linear distance extrapolation factor of 40 dB/decade.

3.2 99% Occupied Bandwidth

3.2.1 Limit

According to RSS-Gen 4.6.1.

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.2.4 Test procedure

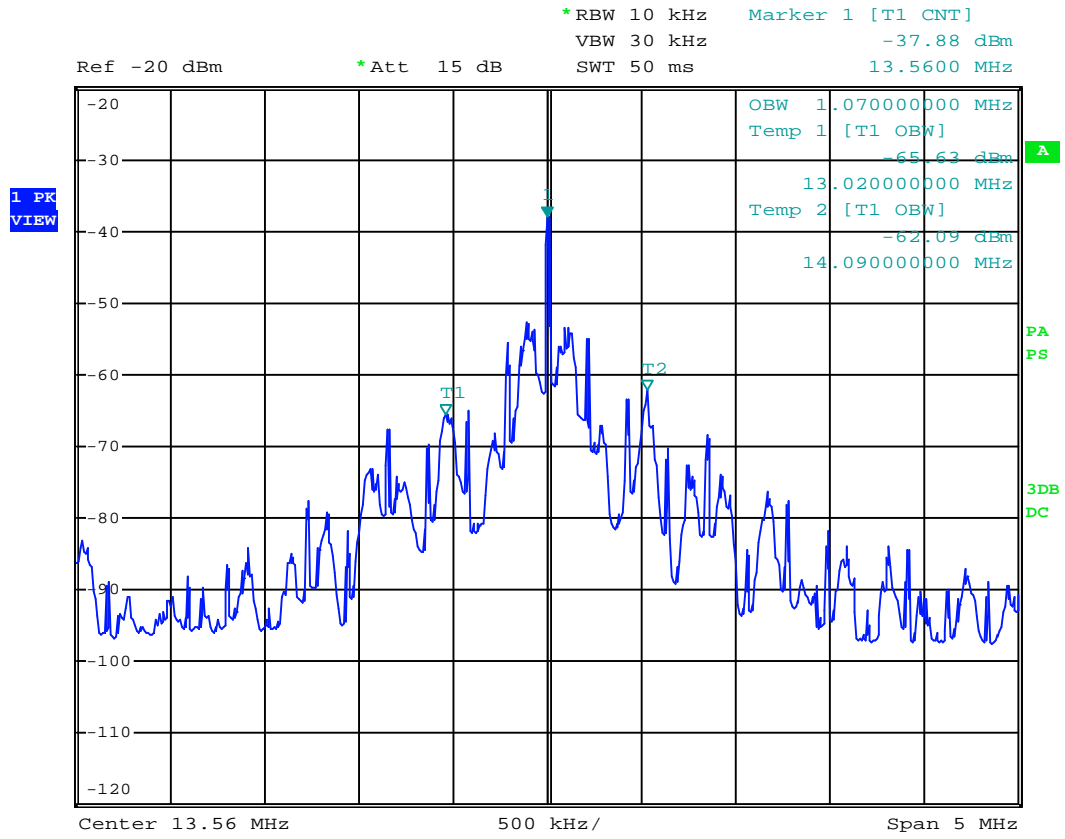
- 1 Set the centre frequency to the nominal EUT channel centre frequency.
- 2 Set span = 1.5 times to 0.5 times the Occupied Bandwidth.
- 3 Set VBW $\geq 3 \times$ RBW.
- 4 Video averaging is not permitted. Where practical detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode(until the trace stabilizes) shall be used.

3.2.5 Test results of the 99% Occupied Bandwidth Measurement

Technology Std.	Frequency (MHz)	99% Occupied Bandwidth (MHz)
RFID	13.56	1.070
Uncertainty		± 1 kHz

3.2.6 Plots of the 99% Occupied Bandwidth Measurement

RFID 99% Occupied Bandwidth



3.3 Field Strength of Unwanted Emissions

3.3.1 Limit

15.225(d)

The field strength of any emissions appearing outside of the 13.110 -14.010 MHz band shall not exceed the general radiated emission limits in part 15.209.

Frequency (MHz)	Field strength ($\mu\text{V}/\text{m}$)	Field strength ($\text{dB}\mu\text{V}/\text{m}$)	Measurement distance(m)
1.705 - 30	30	69.5	3
30 -88	100	40	3
88 - 216	150	43,5	3
216-960	200	46	3
Above 960	500	54	3

3.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.3.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

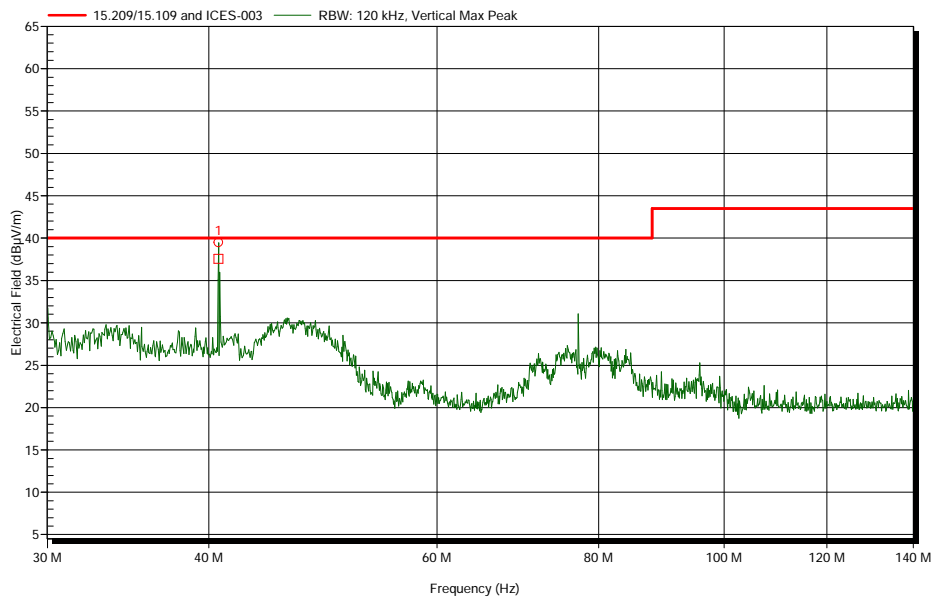
3.3.4 Test procedure

According to ANSI C63.4-2014, section 5.4.2 and 8.2.3

3.3.5 Plots of the Field strength of Unwanted Emissions Measurement

30 MHz to 140 MHz

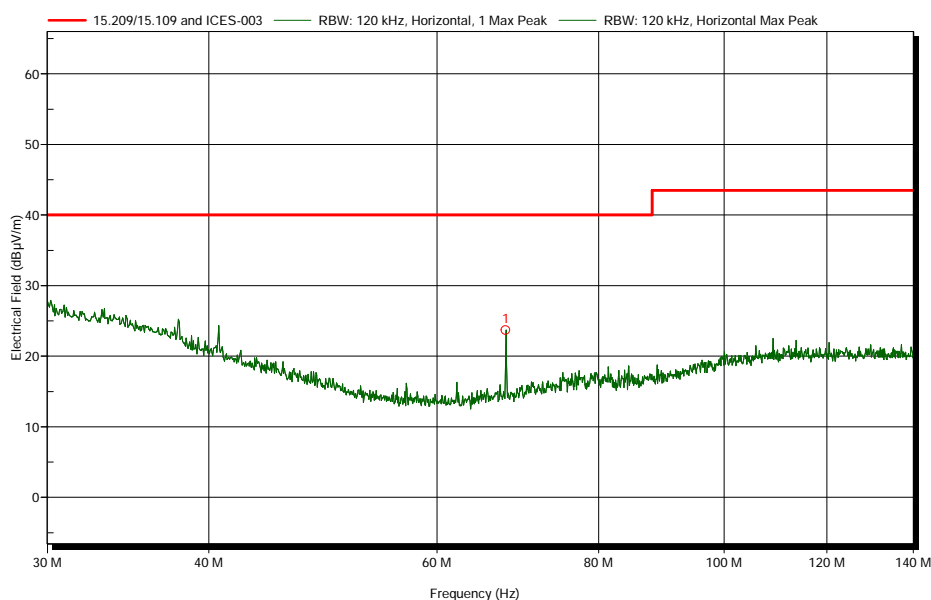
Vertical polarization



Measured peaks Vertical 30 – 140 MHz

Frequency (MHz)	Polarization	Height(m)	Quasi-Peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Margin (dB)
40,68	Vertical	1,5	37,5	40	-2,5

Horizontal polarization



Measured peaks Horizontal 30 – 140 MHz

Frequency (MHz)	Polarization	Height (m)	Peak (dBµV/m)
67,8	Horizontal	2	23,7

3.3.6 Measurement Uncertainty

Horizontal polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

3.4 Frequency Tolerance

3.4.1 Limit

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

3.4.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.4.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.4.4 Test procedure

According to ANSI C63.10-2013, section 6.8

3.4.5 Test results of Frequency Tolerance Measurements

Temperature variation:

Temp. (°C)	-20	-10	0	10	20	30	40	50
Frequency (MHz)	13.5601	13.5601	13.5601	13.5601	13.5601	13.5601	13.5600	13.5600
Deviation (%) ^{*)}	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0	0
Limit (%)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

^{*)} w.r.t. nominal frequency of 13.560 MHz

Voltage variation:

Voltage	Frequency (MHz) ^{*)}	Deviation (%) ^{*)}	Limit (%)
93.5 V	13.5600	0	0.01
110 V	13.5600	0	0.01
126.5 V	13.5600	0	0.01

3.4.6 Measurement Uncertainty

Measurement uncertainty = ± 16 Hz

3.5 AC conducted mains

3.5.1 Limit

§ 15.207 (c)

Frequency range (MHz)	Limits	
	Quasi-Peak (dB μ V)	Average (dB μ V)
0.15 – 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 – 30	60	50

3.5.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.5.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.5.4 Test procedure

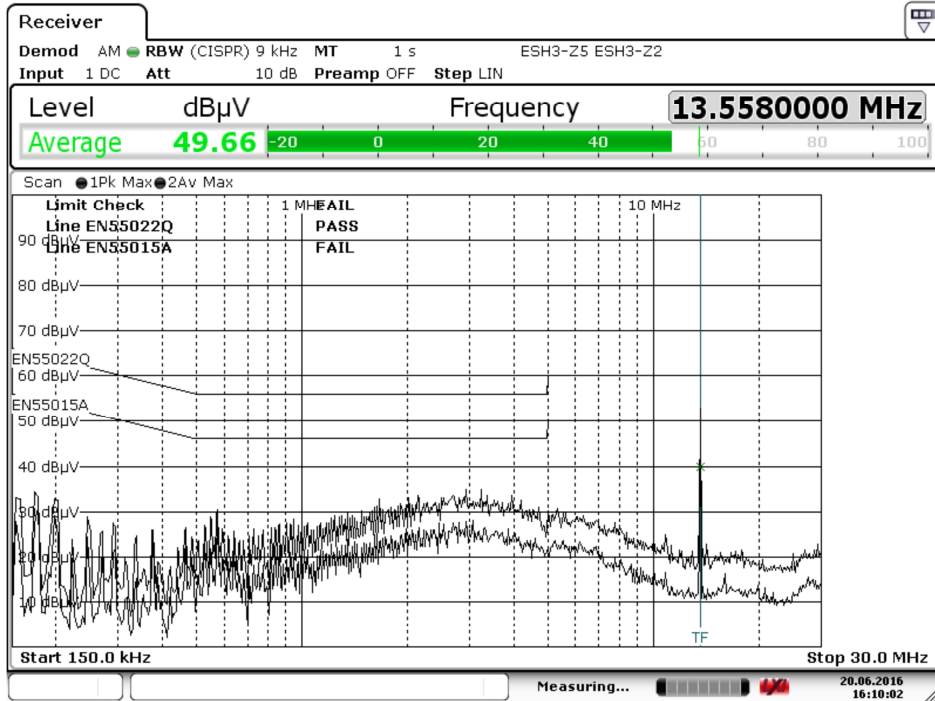
According to According to ANSI C63.4-2014, section 13.3

3.5.5 Measurement uncertainty

+/- 3.6 dB.

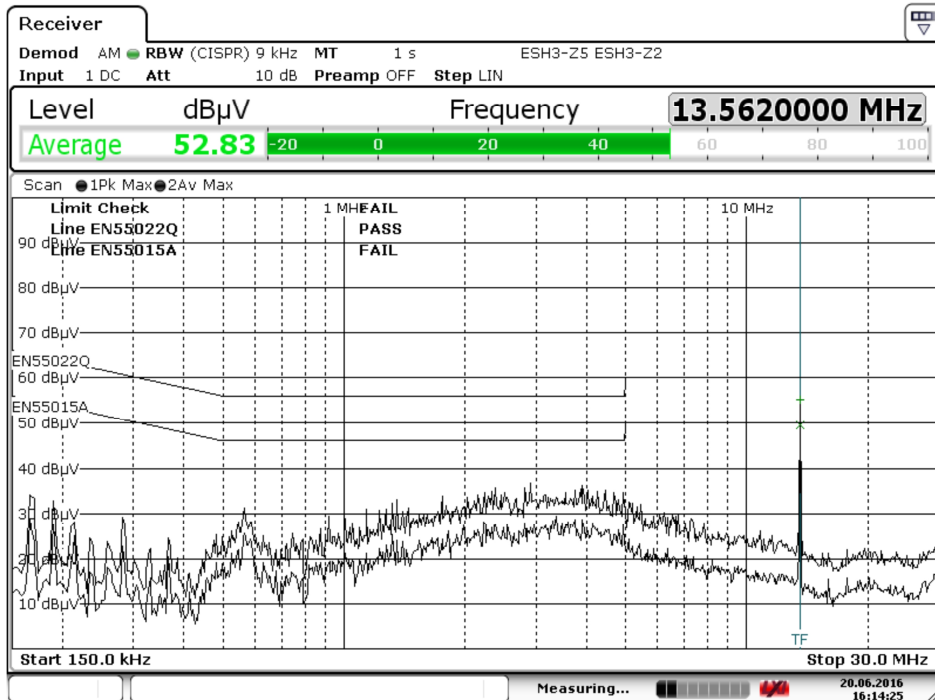
3.5.6 Test results of AC conducted Mains Measurement

Neutral



Note: the average value at 13.56 MHz is 39.84 dBµV/m (margin -10.16 dB)

Live



Note: the average value at 13.56 MHz is 49.42 dBµV/m (margin -0.58 dB) whereas the quasi-peak value is 55.14 dBµV/m (margin -4.86 dB)