

Radio test report

20153854300-Ver 1.10

based on:

FCC part 15C; section 15.247 (Ed. 10-1-14); FCC
part 15C, section 15.225 (Ed 10-1-14); RSS-247,
issue 1

XS4 serie Access Control Electronic Lock BLE
capable
SALTO
ABXX; ABXW

Revision history

| REVISION | DATE | REMARKS | REVISED BY |
|----------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Ver 1.10 | 11 April 2016 | <ul style="list-style-type: none">• IC ID changed;• ABXW details added;• Last sentence in 'Observations and comments' changed;• Product description changed | ing P.A. Suringa. |
| Ver 1.00 | 7 December 2015 | Initial release | ing P.A. Suringa. |
| Ver 0.50 | 20 November 2015 | Release for review | ing P.A. Suringa. |

Contents

| | |
|------------------------------------------------------------------------|-----------|
| REVISION HISTORY | 2 |
| MAIN MODULE | 4 |
| 1 INTRODUCTION..... | 4 |
| 2 PRODUCT..... | 5 |
| 3 TEST SCHEDULE | 5 |
| 4 PRODUCT DOCUMENTATION | 6 |
| 5 OBSERVATIONS AND COMMENTS..... | 6 |
| 6 MODIFICATIONS TO THE SAMPLE | 6 |
| 7 SUMMARY | 6 |
| 8 CONCLUSIONS | 7 |
| TEST RESULTS MODULE | 8 |
| 1 GENERAL INFORMATION..... | 8 |
| 1.1 Equipment information..... | 8 |
| 1.2 Tested channels | 8 |
| 2 EMISSION TESTS ON BLUETOOTH LE | 9 |
| 2.1 Maximum radiated output power | 9 |
| 2.2 Minimum 6 dB bandwidth..... | 10 |
| 2.3 99% power bandwidth..... | 11 |
| 2.4 TX unwanted emissions attenuation (radiated, 1 – 18 GHz)..... | 12 |
| 2.5 TX unwanted emissions attenuation (radiated, 18 – 26 GHz)..... | 13 |
| 2.6 TX unwanted emissions attenuation (radiated, 0.03-1 GHz)..... | 14 |
| 2.7 Maximum power spectral density conducted to the antenna | 15 |
| 3 EMISSION TESTS ON 13.56 MHZ RFID | 16 |
| 3.1 Field strength of emissions (< 30 MHz)..... | 16 |
| 3.2 TX unwanted emissions (radiated, 0.15 - 10 MHz)..... | 17 |
| 3.3 Field strength of unwanted emissions (radiated, 30 - 140 MHz)..... | 18 |
| 3.4 99% power bandwidth..... | 20 |
| 3.5 Frequency tolerance | 21 |
| USED TEST EQUIPMENT MODULE | 22 |
| CROSS REFERENCES | 23 |

This report comprises of three modules. The total number of pages is: 23

Main module

1 Introduction

This report contains the result of tests performed by:

Telefication B.V.
Edisonstraat 12a
6902 PK Zevenaar
The Netherlands

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).

Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Registration Number is: 282250.

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

The contents of this test report, if reproduced, shall be copied in full, unless special consent in writing for reproduction in part is granted by Telefication. Copyright of this test report is reserved to Telefication

Ordering party:

Company name : Salto Systems, S.L.
Address : C/Arkotz 9 Pol. Lanbarren
Zipcode : 20180
City/town : Oiartzun
Country : Spain
Date of order : 19 June 2015

2 Product

A sample of the following product was submitted for testing:

| | | |
|---------------------|---|------------------------------------------------------|
| Product description | : | XS4 serie Access Control Electronic Lock BLE capable |
| Manufacturer | : | Salto systems, S.L. |
| Trade mark | : | SALTO |
| Type designation | : | ABXX; ABXW |
| FCC ID | : | UKCABXX; UKCABXW |
| IC ID | : | 10088A-ABXX; 10088A-ABXW |
| Hardware version | : | -- |
| Serial number | : | -- |
| Firmware release | : | -- |

3 Test schedule

Tests are carried out in accordance with the specification detailed in chapter 7 “Summary” of this report.

Tests are carried out at the following location:

- Telefication, Zevenaar

The sample of the product is received on:

- 3 September 2015

Tests are carried out between:

- 12 October and 10 November 2015

4 Product documentation

For production of this report the following product documentation has been used:

| Identification | Date |
|-----------------------------------------------|------------|
| ABXW_Schematic_RF1.PDF | 26-11-2208 |
| ABXW Operational Description.pdf, version 2.3 | 2-9-2015 |

The above-mentioned documentation will be filed at Telefication for a period of 10 years following the issue of this test report.

5 Observations and comments

The product under test, type ABXX, is a wireless entry system operating on Bluetooth LE and RFID on 13.56 MHz.

A variant, type ABXW, is a wireless entry system containing Bluetooth LE, RFID on 13.56 MHz and ZigBee (IEEE 802.15.4). Additional test results of the variant are contained in additional test report no. 20153854301.

6 Modifications to the sample

No modifications are made to the sample.

7 Summary

The product is intended for use in the following application area(s):

INTENTIONAL RADIATOR OPERATING IN THE FREQUENCY BAND 2400 - 2483.5 MHz

The sample is tested according to the following specification(s):

FCC part 15C; section 15.247 (Ed. 10-1-14); FCC part 15C, section 15.225 (Ed 10-1-14); RSS-247, issue 1

8 Conclusions

The samples of the product showed **NO NON-COMPLIANCES** to the specification stated in chapter 7 of this report:

The results of the tests as stated in this report, are exclusively applicable to the product item as identified in this report. Telefication accepts no responsibility for any stated properties of product items in this test report, which are not supported by the tests as specified in section 7 “*Summary*”.

All tests are performed by:

name : ing. P.A. Suringa

Review of test methods and report by:

name : ing. J.C. le Clercq

The above conclusions have been verified by the following signatory:

Date : 11 April 2016

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

function : Director Certification

signature :



Test results module

1 General information

1.1 Equipment information

| | |
|---------------------------------|--------------------------------------------------------|
| Type of equipment | Wireless entry system using Bluetooth Low Energy (BLE) |
| Modulation | GFSK |
| Spreading type | FHSS |
| Emission designator | 1M00G1D (BLE); unknown (RFID) |
| Bit rate | not specified |
| Operating frequency range (BLE) | 2400 - 2483 MHz |
| Duty cycle (during testing) | 54 % |
| Operating frequency (RFID) | 13.56 MHz |

1.2 Tested channels

| Ch | Frequency (MHz) |
|----|-----------------|
| 1 | 2402 |
| 2 | 2440 |
| 3 | 2480 |

2 Emission tests on Bluetooth LE

2.1 Maximum radiated output power

Compliance standard : FCC part 15, subpart C, section 15.247 (b) (3) (4)
 Method of test : FCC KDB publication No. 558074
 Ambient temperature : 23 °C
 Relative humidity : 47 %

Test results :

| Mode | Level (dBm) | | |
|-----------------------------------------|-------------|------|------|
| | CH 1 | CH 2 | CH 3 |
| Continuously transmitting (D = 54 %) | -0.1 | -1.9 | 2.4 |

Limit:

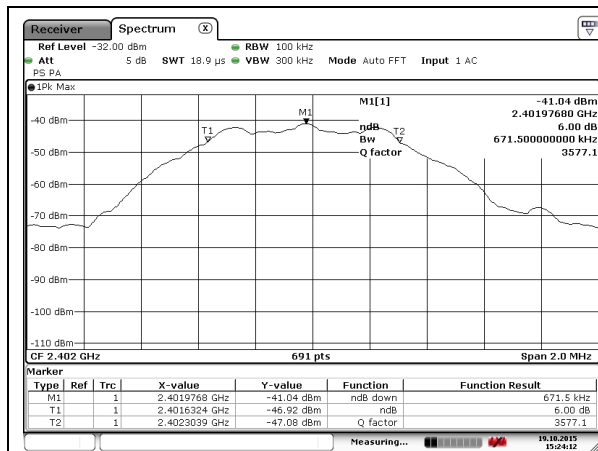
| | |
|-----------------------------------------------|--------------------------------------|
| Maximum conducted output power | ≤ 30 dBm (with antenna gain < 6 dBi) |
| <i>De facto</i> maximum radiated output power | ≤ 36 dBm e.i.r.p. |

Measurement uncertainty: + 1.6 /- 1.9 dB

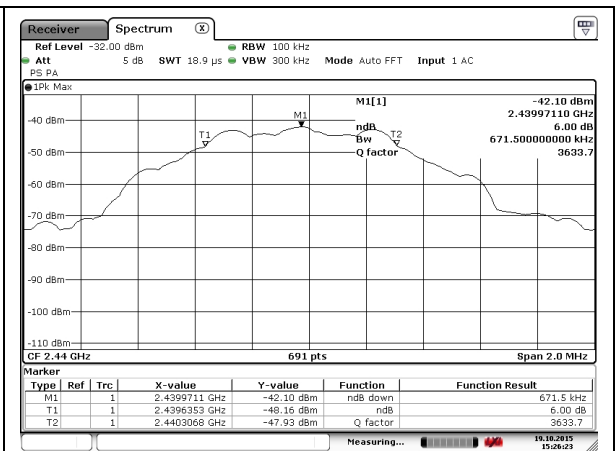
2.2 Minimum 6 dB bandwidth

Compliance standard : FCC part 15, subpart C, section 15.247 (a) (2)
 Method of test : FCC KDB publication No. 558074
 Ambient temperature : 23 °C
 Relative humidity : 47 %

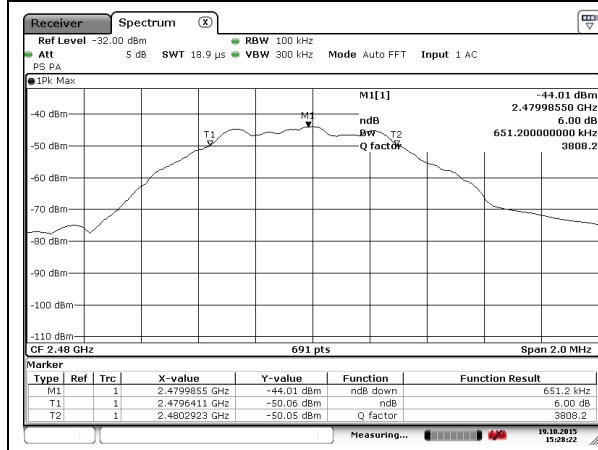
Test results :



CH 11: -6dB bandwidth = 671.5 kHz



CH 18: -6 dB bandwidth = 671.5 kHz



CH 25: -6dB bandwidth = 651.2 kHz

Intentionally left blank

Limit:

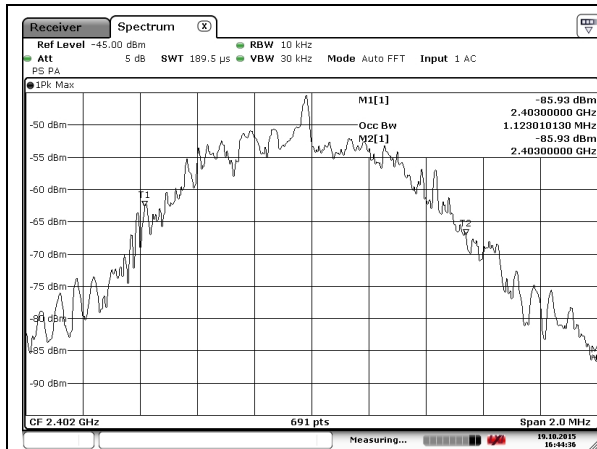
| | |
|------------------------|------------------|
| Minimum 6 dB bandwidth | at least 500 kHz |
|------------------------|------------------|

Measurement uncertainty: +/- 2 kHz

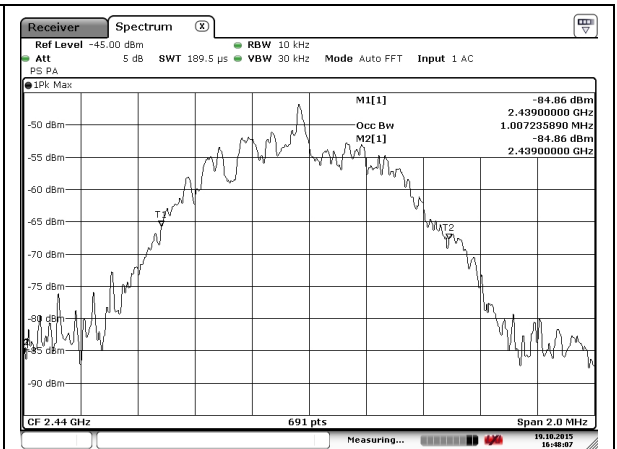
2.3 99% power bandwidth

Compliance standard : IC RSS-Gen, section 4.6.1
 Method of test : IC RSS-Gen, section 4.6.1
 Ambient temperature : 23 °C
 Relative humidity : 47 %

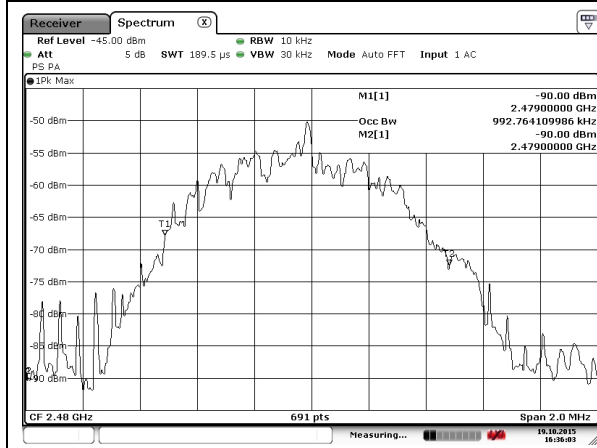
Test results :



CH 11: -6dB bandwidth = 1.12 MHz



CH 18: -6 dB bandwidth = 1.01 MHz



CH 25: -6dB bandwidth = 992.76 kHz

Intentionally left blank

Limit:

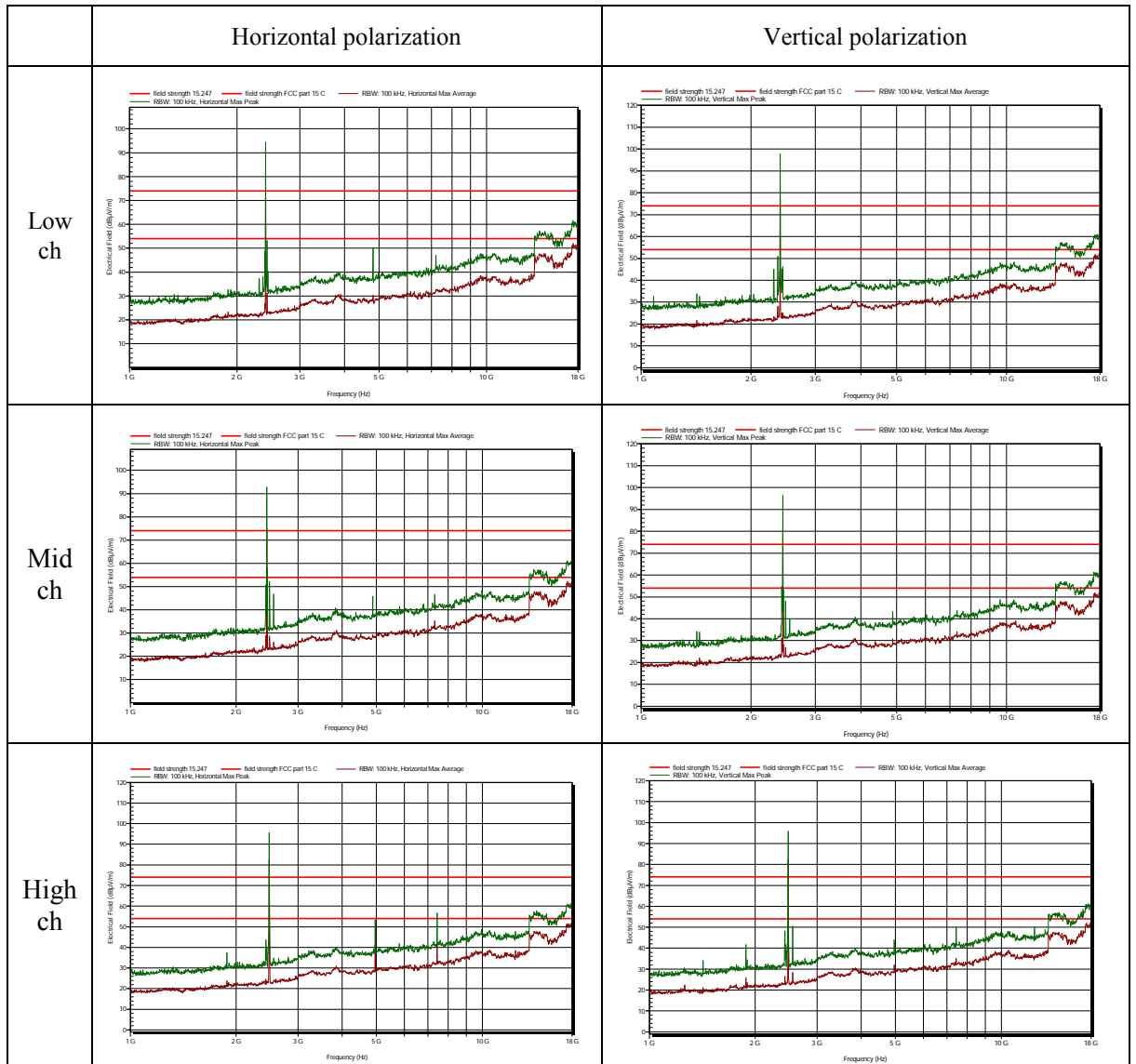
| | |
|---------------------|----|
| 99% power bandwidth | -- |
|---------------------|----|

Measurement uncertainty: +/- 2 kHz

2.4 TX spurious emissions (radiated, 1 – 18 GHz)

Compliance standard : FCC part 15, subpart C, section 15.247(d)
 Method of test : FCC KDB publication No. 558074
 Ambient temperature : 23 °C
 Relative humidity : 47 %

Test results :



Measurement uncertainty: < 2 GHz: + 1.7/- 1.9 dB; ≥ 2 GHz: +2.4/-2.7 dB

Limit:

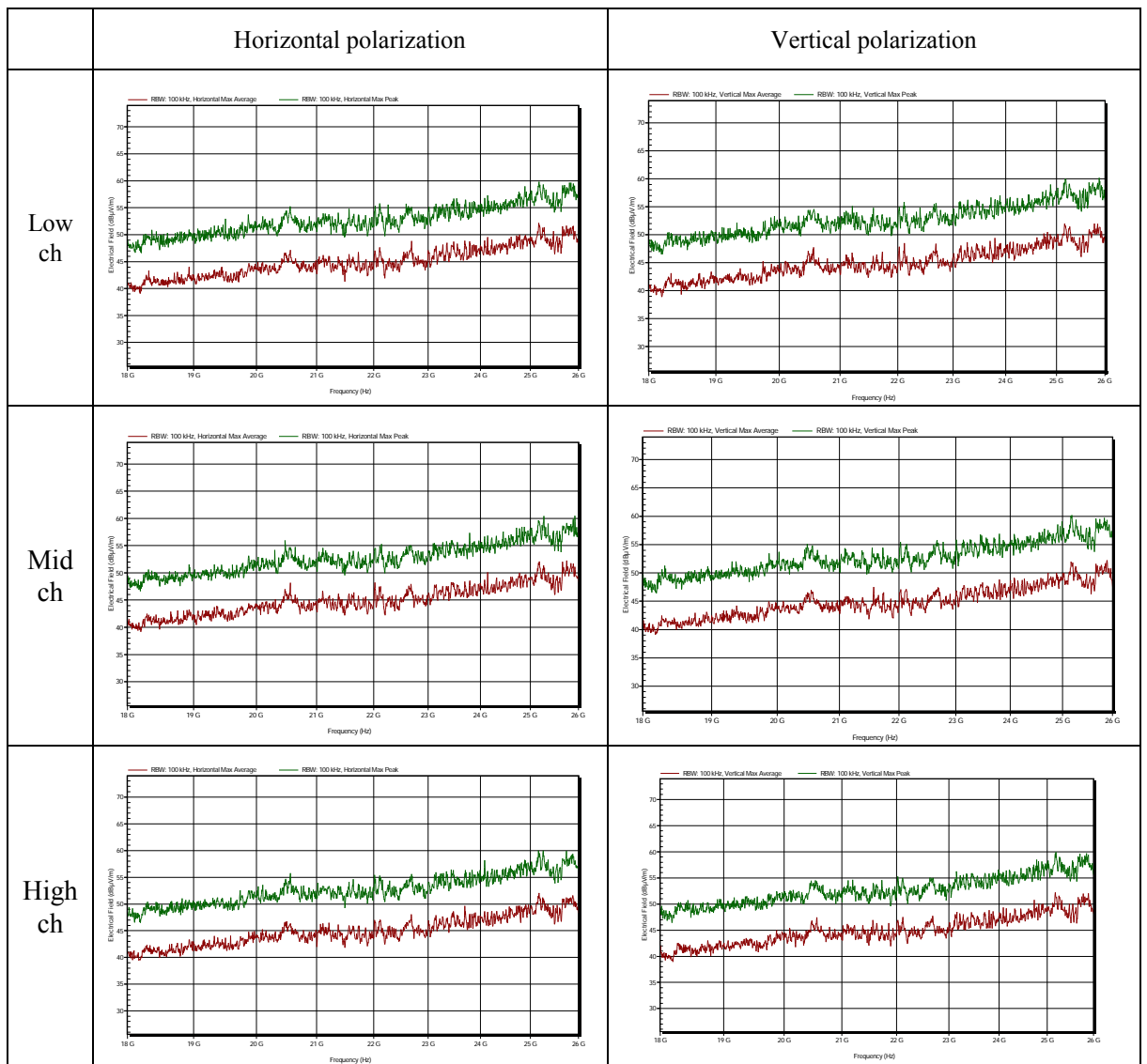
| | |
|--------------------------|----------------------------------------------------------------------------------------------------------------------|
| In any 100 kHz bandwidth | at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz bandwidth. |
|--------------------------|----------------------------------------------------------------------------------------------------------------------|

| | |
|---------------------|-------------|
| In restricted bands | ≤ 54 dBµV/m |
|---------------------|-------------|

2.5 TX spurious emissions (radiated, 18 – 26 GHz)

Compliance standard : FCC part 15, subpart C, section 15.247(d)
 Method of test : FCC KDB publication No. 558074
 Ambient temperature : 23 °C
 Relative humidity : 47 %

Test results :



Measurement uncertainty: < 2 GHz: + 1.7/- 1.9 dB; ≥ 2 GHz: +2.4/-2.7 dB

Limit:

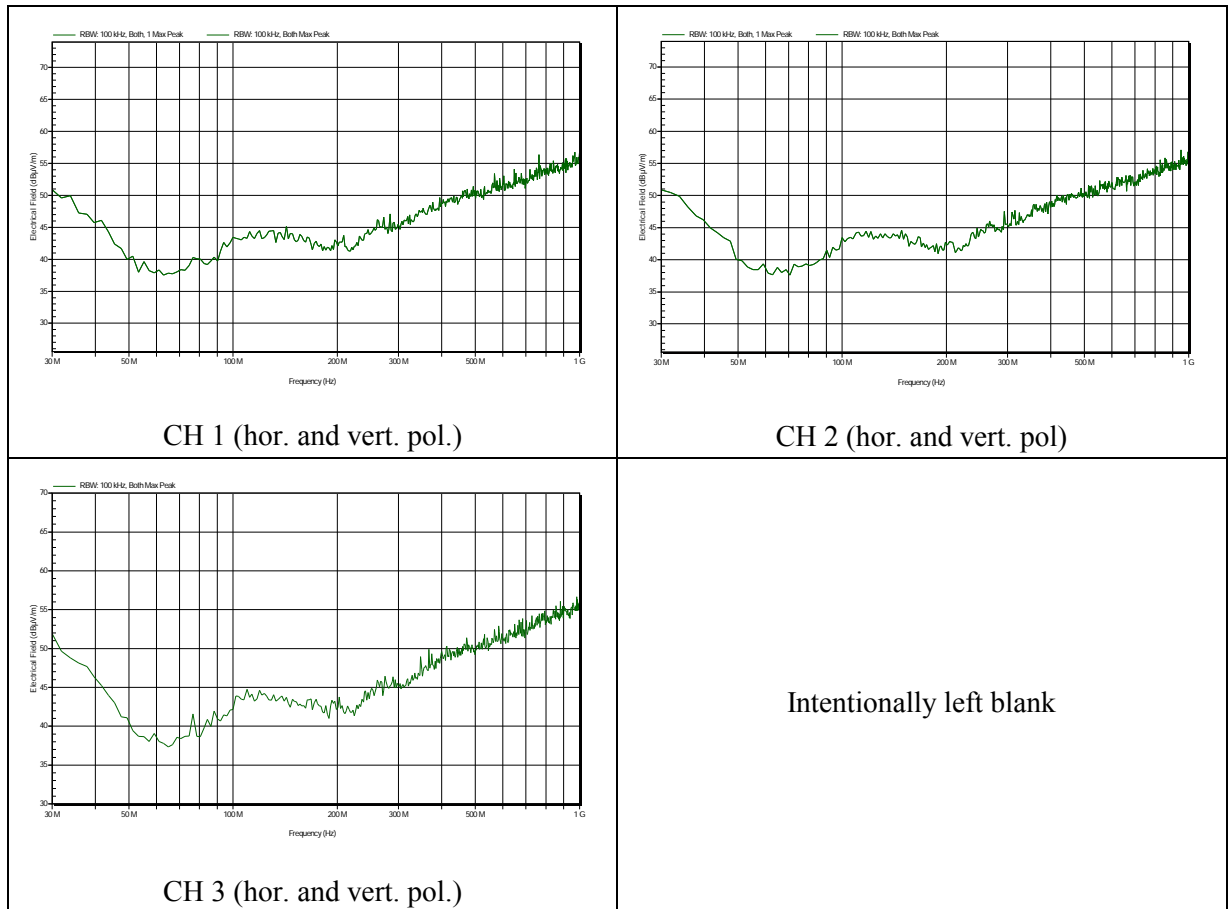
| | |
|--------------------------|----------------------------------------------------------------------------------------------------------------------|
| In any 100 kHz bandwidth | at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz bandwidth. |
|--------------------------|----------------------------------------------------------------------------------------------------------------------|

| | |
|---------------------|-------------|
| In restricted bands | ≤ 54 dBµV/m |
|---------------------|-------------|

2.6 TX spurious emissions (radiated, 0.03-1 GHz)

Compliance standard : FCC part 15, subpart C, section 15.247(d)
 Method of test : FCC KDB publication No. 558074
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test results :



Limit:

| | |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Field strength at 3 meter distance | 30 – 88 MHz: $\leq 40 \text{ dB}\mu\text{V/m}$; 88 – 216 MHz: $\leq 43.5 \text{ dB}\mu\text{V/m}$; 216 – 960 MHz: $\leq 46 \text{ dB}\mu\text{V/m}$; Above 960 MHz: $\leq 54 \text{ dB}\mu\text{V/m}$ |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

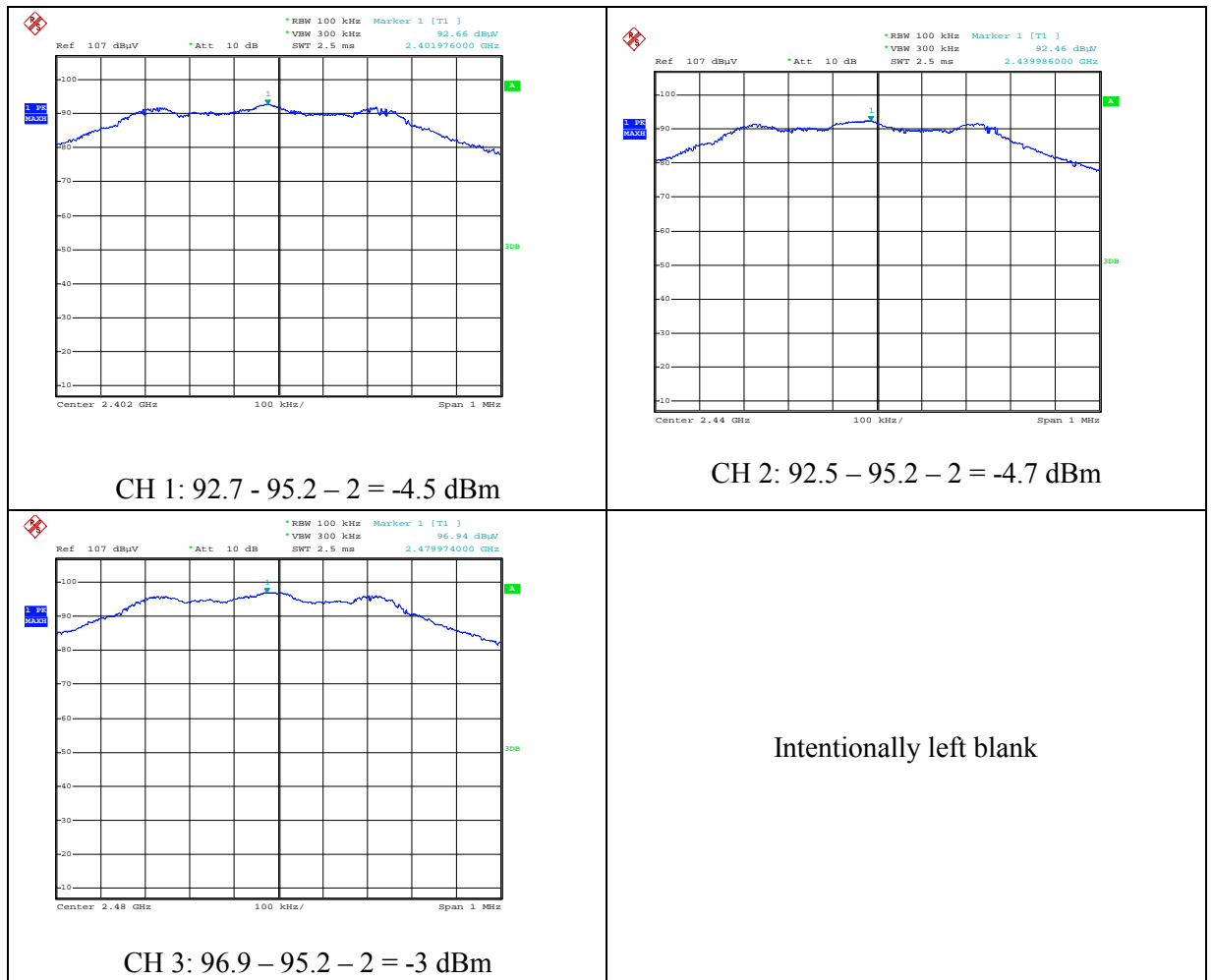
Measurement uncertainty:

| 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 |

2.7 Maximum power spectral density conducted to the antenna

Compliance standard : FCC part 15, subpart C, section 15.247(e)
 Method of test : FCC KDB publication No. 558074
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test results :



Measurement uncertainty: < 2 GHz: + 1.7/- 1.9 dB;
 ≥ 2 GHz: + 2.4/- 2.7 dB

Limit:

| | |
|-------------------|-------------------------------------------------------------------|
| In any 3 kHz band | Not greater than 8 dBm during any time of continuous transmission |
|-------------------|-------------------------------------------------------------------|

3 Emission tests on 13.56 MHz RFID

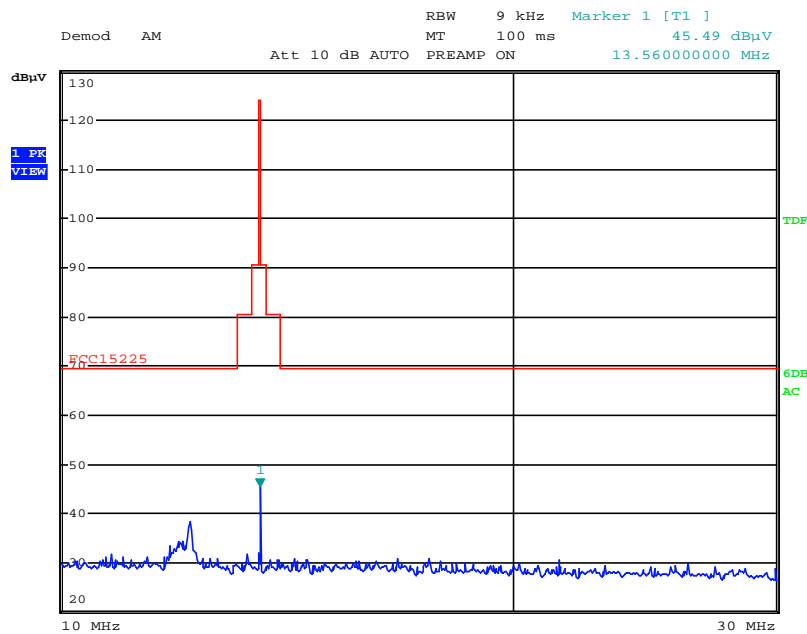
3.1 Field strength of emissions (< 30 MHz)

Compliance standard : FCC part 15, subpart C, section 15.225 (b), (c)
 FCC part 15, subpart C, section 15.205;
 FCC part 15, subpart B, section 15.209 (a)

Method of test : ANSI C63.4-2003, sections 5.3 & 8.2.1; FCC part 15, subpart A,
 section 15.31 (f) (2), 15.33, 15.35.

Test results :

(unit in dB μ V/m)



The maximum field strength at 13.56 MHz is: 45.5 dB μ V/m (3 m distance)

| | |
|-------------------------|----------------|
| Measurement uncertainty | +1.9 / -2.1 dB |
|-------------------------|----------------|

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

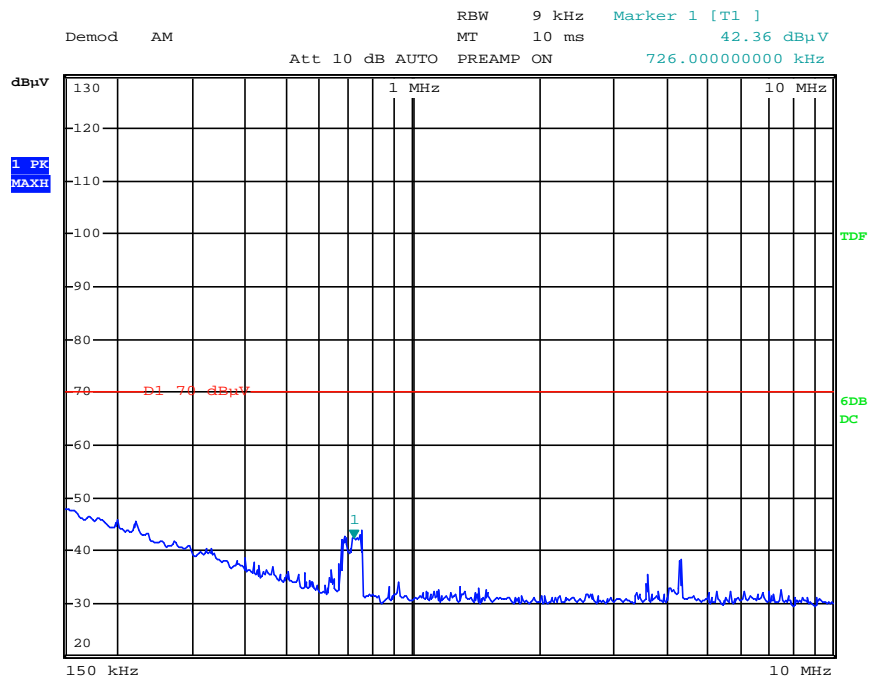
3.2 TX unwanted emissions (radiated, 0.15 - 10 MHz)

Compliance standard : FCC part 15, subpart C, section 15.225 (a)

Method of test : ANSI C63.4-2003, sections 5.3 & 8.2.1; FCC part 15, subpart A, section 15.31 (f) (2), 15.33, 15.35.

Test results :

(unit in dB μ V/m)

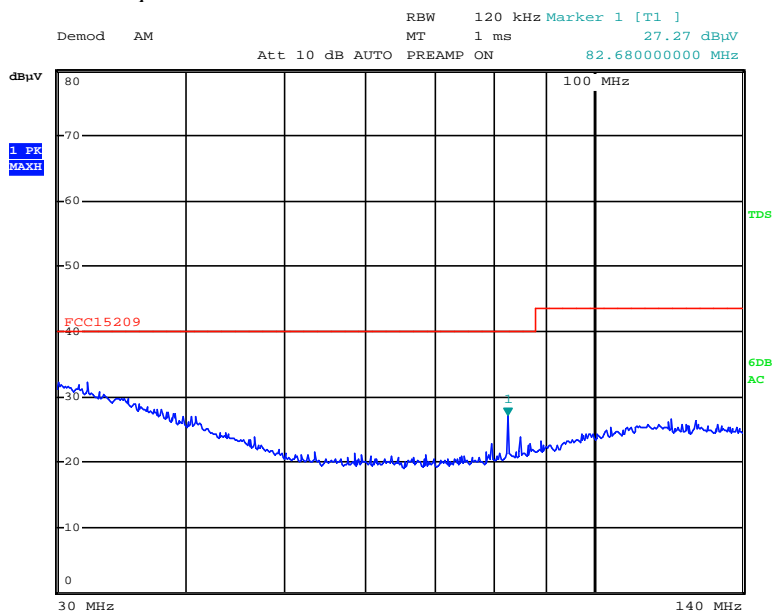


3.3 Field strength of unwanted emissions (radiated, 30 - 140 MHz)

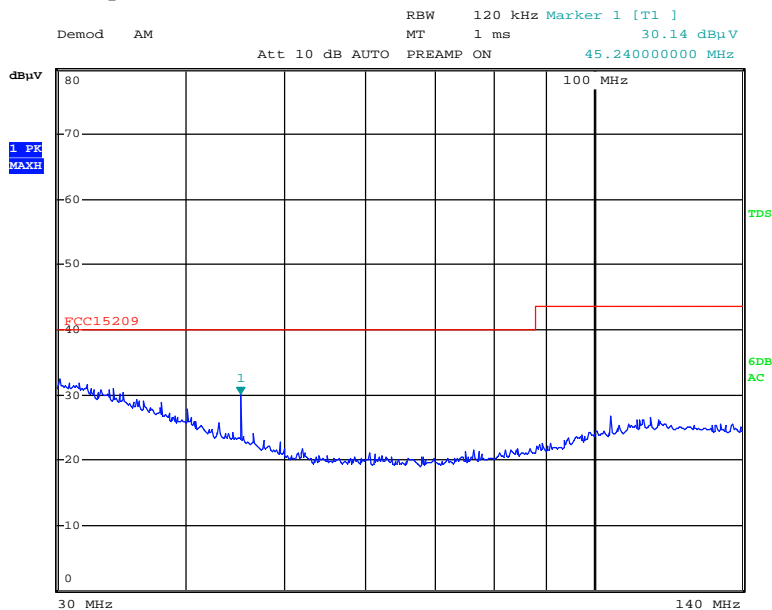
Compliance standard : FCC part 15, subpart C, section 15.225 (d)
 FCC part 15, subpart C, section 15.205
 FCC part 15, subpart C, section 15.209 (a)
 Method of test : ANSI C63.4-2003, sections 5.4.2 & 8.2.3;
 FCC part 15, subpart A, sections 15.33, 15.35.

Test results: :

Horizontal polarization



Vertical polarization



Measurement uncertainty

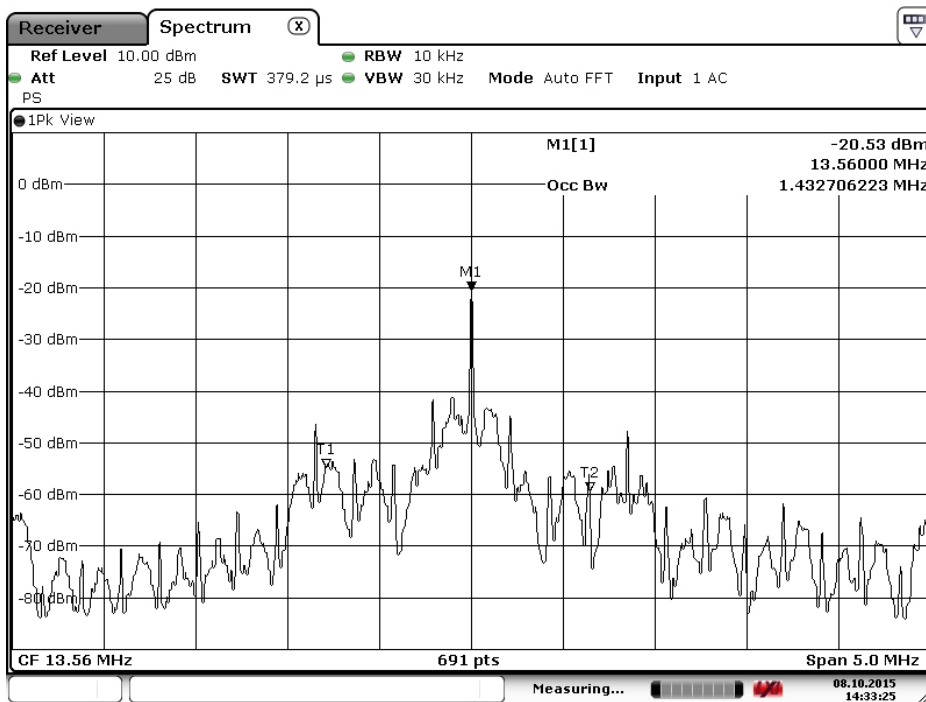
| Horizontal polarization | |
|-------------------------|--------|
| 30 – 200 MHz | 4.5 dB |
| 200 – 1000 MHz | 3.6 dB |
| Vertical polarization | |
| 30 – 200 MHz | 5.4 dB |
| 200 – 1000 MHz | 4.6 dB |

3.4 99% power bandwidth

Compliance standard : ICC RSS 210

Method of test : Occupied bandwidth 99 %

Test results: :



| | |
|-------------------------|-------|
| Measurement uncertainty | 1 kHz |
|-------------------------|-------|

3.5 Frequency tolerance

Compliance standard : FCC part 15, subpart C, section 15.225 (e)

Method of test : ANSI C63.10-2009, clause 6.8

Test results: :

Temperature variation:

| | | | | | | | | |
|-----------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Temp. (°C) | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 |
| Frequency (MHz) | 13.5601 | 13.5602 | 13.5602 | 13.5602 | 13.5601 | 13.5601 | 13.5601 | 13.5600 |
| Deviation (%)*) | 0.0007 | 0.0015 | 0.0015 | 0.0015 | 0.0007 | 0.0007 | 0.0007 | 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 (%) |
|---------|-------------------|-----------------|-----------|
| 3.825 V | 13.5601 | 0.0007 | 0.01 |
| 4.5 V | 13.5601 | 0.0007 | 0.01 |
| 5.175 V | 13.5601 | 0.0007 | 0.01 |

*) w.r.t. nominal frequency of 13.560 MHz

| | |
|-------------------------|------------|
| Measurement uncertainty | + /- 16 Hz |
|-------------------------|------------|

Used test equipment module

| Description | ID | Manufacturer | Model | Used at par. |
|---------------------|----------|-----------------|--------------------------|------------------------------|
| Spectrum Analyzer | TE 11125 | Rohde & Schwarz | FSP 40 | 2.1, 2.6, 2.7 |
| Spectrum Analyzer | TE 01220 | Rohde & Schwarz | ESR7 | 2.2, 2.3, 3.5 |
| Thermometer | TE 00388 | Fluke | 51 | 3.5 |
| Pre amplifier | TE 11132 | Miteq | AFS42-041001800-28-OP-42 | 2.1, 2.4, 2.7 |
| Horn antenna | TE 00531 | EMCO | 3115 | 2.1, 2.2, 2.3, 2.4, 2.7 |
| Semi Anechoic Room | TE 00861 | Comtest | -- | 2.1, 2.4, 2.6, 3.1, 3.2, 3.3 |
| EMI test receiver | TE 11128 | Rohde & Schwarz | ESCI | 3.1, 3.2, 3.3 |
| Biconilog antenna | TE 00967 | Chase | CBL6112A | 2.6 |
| Active loop antenna | TE 00746 | Rohde & Schwarz | HFH2-Z2 | 3.1, 3.2 |
| Pre amplifier | TE 11131 | Miteq | JS4-18004000 | 2.5 |
| Digital Multi Meter | TE 01305 | Fluke | 87 V | 3.5 |
| Climate Chamber | TE 00741 | CTS | -40/350 | 3.5 |

Cross References

| FCC | IC RSS | Description | Section in report |
|---------------|------------|------------------------------|-------------------|
| 15.247(a) (2) | 247 §5.2.1 | 6dB Bandwidth | 2.2 |
| §2.1049(h) | GEN §4.6.1 | 99% Bandwidth | 2.3 |
| 15.247(b) | 247§ 5.4.4 | RF Output Power | 2.1 |
| 15.247(e) | 247 §5.2.2 | Power Spectral Density | 2.7 |
| 15.247(d) | 247 §5.5 | Conducted Band edges | -- |
| 15.247(d) | 247 §5.5 | Conducted Spurious Emissions | -- |
| 15.247(d) | 247 §5.5 | Radiated Band edges | -- |
| 15.247(d) | 247 §5.5 | Radiated Spurious Emissions | 2.4, 2.5, 2.6 |
| 15.203 | - | Antenna Requirements | -- |

| | | |
|-----------------------------|--------------------------------------------------|-------------------|
| IC RSS-210 Issue 8 | FCC 47 CFR Part 15, subpart C (1-Oct-14 Edition) | Section in report |
| Section 2.5 | § 15.209 | |
| Section 2.5 | § 15.205 | 2.7 |
| IC RSS-210 Issue 8, Annex 2 | FCC 47 CFR Part 15, subpart C (1-Oct-14 Edition) | |
| Annex A2.6 (a) | § 15.225 (a) | 3.2 |
| Annex A2.6 (b) | § 15.225 (b) | 3.1 |
| Annex A2.6 (c) | § 15.225 (c) | 3.1 |
| Annex A2.6 (d) | § 15.225 (d) | 3.3 |
| Annex A2.6 | § 15.225 (e) | 3.5 |