



**TEST REPORT CONCERNING THE COMPLIANCE OF A  
AN ARTICLE SURVEILLANCE (EAS) SYSTEM,  
BRAND Nedap, MODEL X2,  
WITH 47 CFR PART 15 (10-1-09).**

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February 6, 2012**

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**MEASUREMENT/TECHNICAL REPORT**

**N.V. Nederlandsche Apparatenfabriek "Nedap"  
 Model: X2**

**FCC ID: CGDX2**

This report concerns: Original grant/certification <del>Class 2 change</del> Verification		
Equipment type: Article Surveillance (EAS) System		
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The data taken for this test and report herein was done in accordance with 47 CFR Part 15 (10-1-09 edition) and the measurement procedures of ANSI C63.4-2009. TÜV Rheinland EPS B.V. at Niekerk, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment Under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: February 6, 2012

Signature:



O. Hoekstra  
 Senior Engineer Telecom TÜV Rheinland EPS B.V.

### Summary

The device under test does:

- fulfill the general approval requirements as identified in this test report
- not fulfill the general approval requirements as identified in this test report


### Description of test item

Test item : Article Surveillance (EAS) System  
Manufacturer : N.V. Nederlandsche Apparatenfabriek "Nedap"  
Brand : Nedap  
Model : X2  
Serial number : --  
FCC ID : CGDX2

### Applicant information

Applicant's representative : Mr. J. Hulshof  
Company : N.V. Nederlandsche Apparatenfabriek "Nedap"  
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Country : The Netherlands  
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### Test(s) performed

Location : Niekerk  
Test(s) started : October 31, 2011  
Test(s) completed : February 3, 2012  
Purpose of test(s) : Equipment Authorization (Original grant/certification)  
Test specification(s) : 47 CFR Part 15 (10-1-09 Edition)  
Test engineer(s) : R. van der Meer   
Report written by : R. van der Meer  
Report date : February 07, 2012

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The test results relate only to the item(s) tested.

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**1 General information.**

**1.1 Product description.**

**1.1.1 Introduction.**

The system is an Article Surveillance (EAS) System for detection of 8.2MHz EAS labels, hard tags or disposable paper tags, used at the entry of shops, libraries etc. It is tested in combination with 5 different antennas, knowing: PG27, PG39, FL30, FL45 and EQ45-F. The system is a digital swept frequency hopping transmitter operating from 7.4-8.8 MHz.

The content of this report and measurement results have not been changed other than the way of presenting the data.

**1.2 Related submittal(s) and/or Grant(s).**

**1.2.1 General.**

This test report supports the original grant/certification in equipment authorization files under FCC ID: CGDX2.

**1.3 Tested system details.**

Details and an overview of the system and all of its components, as it has been tested, may be found below.

EUT	:	Article Surveillance (EAS) System
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand	:	Nedap
Model	:	X2
Serial number	:	--
Voltage input rating	:	6 – 33Vdc
Voltage output rating	:	--
Current input rating	:	not provided
Remarks	:	module inside antenna

AUX1	:	AC Power Supply
Manufacturer	:	Power-Win Technology Corp.
Brand	:	Power-Win Technology Corp.
Model (Type)	:	PW-065A-1930F1
Serial number	:	3931478
Voltage input rating	:	100 – 240Vac
Voltage output rating	:	30Vdc
Current input rating	:	2A
Current output rating	:	1.5A
Remarks	:	FCC approved



Test item (AUX 2)	:	Antenna
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek Nedap
Brand	:	Nedap
Model	:	PG27
Type (Art. Nr.)	:	9937323
Serial number	:	--
Voltage input rating	:	From AUX1
Current input rating	:	n.a.
Remark	:	--
Test item (AUX 3)	:	Antenna
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek Nedap
Brand	:	Nedap
Model	:	PG39
Type (Art. Nr.)	:	9940588
Serial number	:	--
Voltage input rating	:	From AUX1
Current input rating	:	n.a.
Remark	:	--
Test item (AUX 4)	:	Antenna
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek Nedap
Brand	:	Nedap
Model	:	FL30
Type (Art. Nr.)	:	9202340
Serial number	:	--
Voltage input rating	:	From AUX1
Current input rating	:	n.a.
Remark	:	--
Test item (AUX 5)	:	Antenna
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek Nedap
Brand	:	Nedap
Model	:	FL45
Type (Art. Nr.)	:	9202447
Serial number	:	--
Voltage input rating	:	From AUX1
Current input rating	:	n.a.
Remark	:	--
Test item (AUX 6)	:	Antenna
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek Nedap
Brand	:	Nedap
Model	:	EQ45-F
Type (Art. Nr.)	:	9886168
Serial number	:	--
Voltage input rating	:	From AUX1
Current input rating	:	n.a.
Remark	:	--

#### 1.4 Test Summary

The EUT was tested in accordance with the specifications given in the table below.

Test Standard	Description	Page	Pass / Fail
47 CFR Part 15 (10-1-09 Edition)			
15.207(a)	Conducted emissions	14	Pass
15.209	Radiated emissions	11 - 13	Pass
15.215(c)	Occupied bandwidth	15	Pass

Table : testspecifications

Testmethods: ANSI C63:2009

1.4.1 Description of input and output ports.

Number	Terminal	From	To	Remarks
1	Mains	Mains	AUX1	--
2	Antenna coax cable	EUT 1	AUX 2 - 6 transmitter	Shielded cable

Operation mode 1: System "Passive", not detecting a label.  
 Operation mode 2: System "Active", detecting a label.

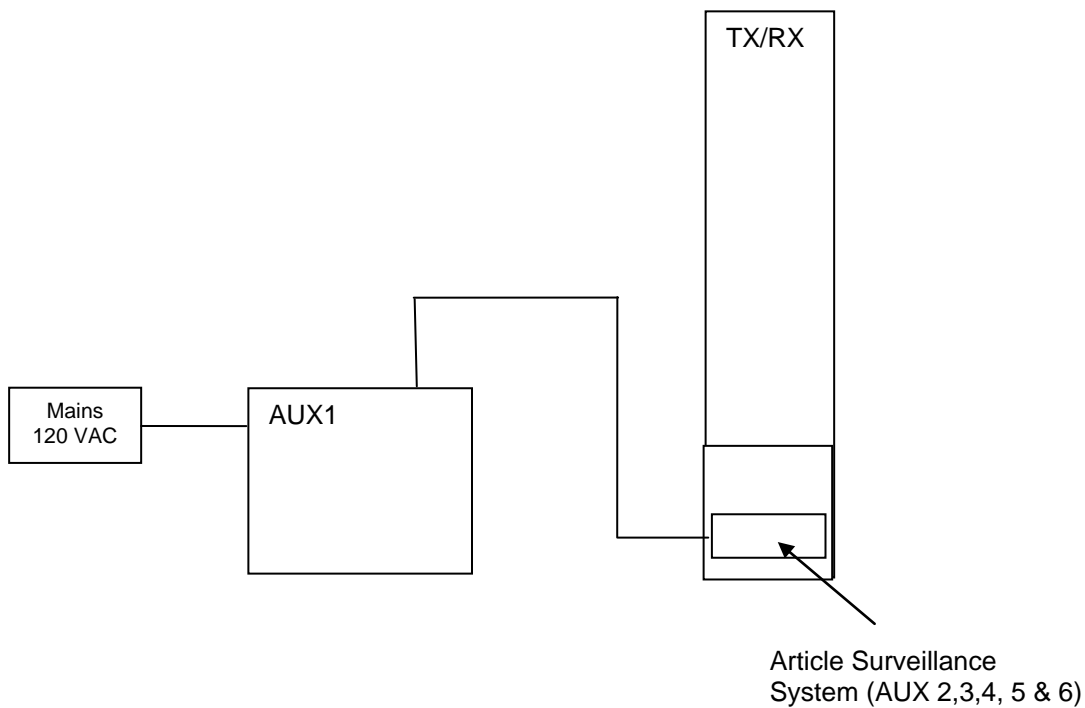


Figure 1: Basic testsetup and connections



## 1.5 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (10-1-09 Edition), sections 15.31, 15.207 and 15.209.

The test methods, which have been used, are based on ANSI C63.4: 2009 and KDB 174176.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters.

Radiated emission tests below 30 MHz were performed at a measurement distance of 3 meters .

To calculate the field strength level from these results to the appropriate distance at which the limit is specified, the appropriate extrapolation factor is used.

The receivers are switching automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. The antenna factors are programmed in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate antenna factor for the cable loss. The total correction is automatically added to the measured value.

## 1.6 Test facility.

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland EPS B.V., located in Niekerk, 9822 TL Smidshornerweg 18, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948 (10-1-06 edition).

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The description of the test facilities has been filed to Industry Canada under registration number 2932G-1. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

## 1.7 Test conditions.

Normal test conditions:

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: 120VAC/60Hz to the AC/DC Power Supply – the DC output was varied across the voltage range specified by the manufacturer
Air pressure	: 950 – 1050 hPa

When it was impracticable to carry out the tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests are stated separately.

## 2 System test configuration.

### 2.1 Justification.

The system was configured for testing in a typical situation as a customer would normally use it.

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4: 2009.

### 2.2 EUT mode of operation.

The EUT has been tested in passive mode , i.e. the EUT is ready to detect a tag, since in that mode the power level is always at it's maximum value. While in active mode, ie while reading a tag, the power level is reduced to prevent damaging the tag. The intentional radiator tests have been performed with a complete functioning EUT and interconnections.

To make correct measurements possible the frequency sweep of the transmitter is stopped during the measurements.

### 2.3 Special accessories.

No special accessories are used and/or needed to achieve compliance.

### 2.4 Equipment modifications.

No modifications have been made to the equipment in order to achieve compliance.

### 2.5 Product Labelling

The product labeling information is available in the technical documentation package.

### 2.6 Block diagram of the EUT.

The block diagram is available in the technical documentation package.

### 2.7 Schematics of the EUT.

The schematics are available in the technical documentation package.

### 2.8 Part list of the EUT.

The part list is available in the technical documentation package.

### 3 No operation in restricted bands

The EUT is a digital swept frequency hopping transmitter. The EUT hops on discrete frequencies. The discrete frequencies that can be transmitted by the EUT are as follows:

Channel	1	7565000	Hz
Channel	2	7608750	Hz
Channel	3	7652500	Hz
Channel	4	7696250	Hz
Channel	5	7740000	Hz
Channel	6	7783750	Hz
Channel	7	7827500	Hz
Channel	8	7871250	Hz
Channel	9	7915000	Hz
Channel	10	7958750	Hz
Channel	11	8002500	Hz
Channel	12	8046250	Hz
Channel	13	8090000	Hz
Channel	14	8133750	Hz
Channel	15	8177500	Hz
Channel	16	8221250	Hz
Channel	17	8265000	Hz
Channel	18	8308750	Hz
Channel	19	8352500	Hz
Channel	20	8396250	Hz
Channel	21	8440000	Hz
Channel	22	8483750	Hz
Channel	23	8527500	Hz
Channel	24	8571250	Hz

## 4 Radiated emission data.

### 4.1 Radiated field strength measurements (30 MHz – 1 GHz, E-field), EUT with AUX2 (PG27)

Frequency (MHz)	Measurement results @3m Vertical (dB $\mu$ V)	Measurement results @3m Horizontal (dB $\mu$ V)	Correction factor (dB)	Results after correction Vertical (dB $\mu$ V/m)	Results after correction Horizontal (dB $\mu$ V/m)	Limits @3m (dB $\mu$ V/m)	Pass/Fail
33.1	7.4	-2.6	17.9	25.3	15.3	40.0	Pass
37.8 (l)	15.2	2.2	14.5	29.7	16.7	40.0	Pass
42.8 (h)	20.1	4.8	12.0	32.1	16.8	40.0	Pass
52.9 (l)	17.7	4.1	8.6	26.3	12.7	40.0	Pass
60.0 (h)	16.5	4.3	8.1	24.6	12.4	40.0	Pass
68.1 (l)	11.0	5.2	7.8	18.8	13.0	40.0	Pass
77.1 (h)	13.2	6.1	8.4	21.6	14.5	40.0	Pass
908.7	-2.8	-2.4	33.1	30.3	30.7	46.0	Pass

Note:

(l): Sweep stopped at lowest frequency

(h): Sweep stopped at highest frequency

Table 1 Radiated emissions of the EUT

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209, are depicted in Table 1. The system is tested as a whole, so with all equipment as shown in Figure.1 in place and functioning. Being the worst case situation.

#### Notes:

- Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
- Measurement uncertainty is  $\pm 5.0$ dB
- The reported field strength values are the worst case values at the indicated frequency. The EUT was varied in three positions, the antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
- A Quasi-peak detector was used with a resolution bandwidth of 120 kHz.
- The EUT was tested in passive mode (i.e. without a tag in its proximity). Maximum values have been noted.

Used test equipment and ancillaries:

99069	99070	99071	99107	99608	99609	99699	99547	15453
99580								

Test engineer

Signature :



Name : Richard van der Meer

Date : November 15, 2011

#### 4.2 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field), EUT with AUX2 (PG27)

Frequency (kHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dBµV @3m						
7565	52.1	Pk	19.5	1	40	32.6	60
8046	53.3	Pk	19.5	1	40	33.8	60
8571	52.7	Pk	19.5	1	40	33.2	60

Note:

Sweep stopped at lowest, middle and highest frequency

Table 2a Radiated emissions of the EUT in combination with AUX2, Peak values

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.223 and 15.35 with the EUT operating in continuous transmit mode, are depicted in Table 2a, 2b and 2c.

#### Notes:

1. Calculated measurement results are obtained by using the 40dB/decade extrapolation factor, antenna factor and cable loss. i.e at 8.60 MHz: 52.7 dBµV + 19.5dB + 1dB - 40dB= 33.2 dBµV/m.
2. A resolution bandwidth of 9kHz was used during testing
3. Field strength values of radiated emissions at frequencies not listed in Table 2a and 2c are more than 20 dB below the applicable limit
4. The loop antenna was varied in horizontal and vertical orientations and also around it's axis. The reported value is the worst case found at the reported frequency.
5. The EUT was tested in passive mode (i.e. without a tag in its proximity). Maximum values have been noted.
6. Measurement uncertainty is ±5.0dB

Used test equipment and ancillaries:

99069	99070	99107	99120	15453	99608	99609	99699	99699
99580								

Frequency (kHz)	Measurement results Peak	Detector	Correction factor	Measurement results (calculated Average)	Limits
	dB $\mu$ V @3m			dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
7565	32.6	Pk	-23.28	9.3	40.0
8046	33.8	Pk	-23.28	10.5	40.0
8571	33.2	Pk	-23.28	9.9	40.0

Note:  
Sweep stopped at lowest, middle and highest frequency

Table 2b Radiated emissions of the EUT in combination with AUX2, Average values

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dB $\mu$ V @3m					dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
10.0	19.8	Qp	19.7	1	40	0.5	40.0
11.0	13.1	Qp	19.7	1	40	-6.2	29.5
15.1 - 17.2	4.2	Qp	19.7	1	40	-15.1	29.5

Note:  
Sweep stopped at lowest, middle and highest frequency

Table 2c Radiated emissions of the EUT in combination with AUX2, Quasi-Peak values

Test engineer

Signature : 

Name : R. van der Meer  
Date : November 09, 2011.

### 4.3 Radiated field strength measurements (30 MHz – 1 GHz, E-field), EUT with AUX3 (PG39)

Frequency (MHz)	Measurement results @3m Vertical (dBµV)	Measurement results @3m Horizontal (dBµV)	Correction factor (dB)	Results after correction Vertical (dBµV/m)	Results after correction Horizontal (dBµV/m)	Limits @3m (dBµV/m)	Pass/Fail
33.1	7.7	-2.6	17.9	25.6	15.3	40.0	Pass
37.8 (l)	19.9	6.9	14.5	34.4	21.4	40.0	Pass
42.8 (h)	11.1	1.4	12.0	23.1	13.4	40.0	Pass
52.9 (l)	14.6	4.0	8.6	23.2	12.6	40.0	Pass
60.0 (h)	13.6	4.4	8.1	21.7	12.5	40.0	Pass
68.1 (l)	10.6	5.5	7.8	18.4	13.3	40.0	Pass
77.1 (h)	11.4	6.2	8.4	19.8	14.6	40.0	Pass
908.7	-2.7	-2.5	33.1	30.4	30.6	46.0	Pass

Note:

- (l): Sweep stopped at lowest frequency  
 (h): Sweep stopped at highest frequency

Table 3 Radiated emissions of the EUT

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209, are depicted in Table 3. The system is tested as a whole, so with all equipment as shown in Figure 1 in place and functioning. Being the worst case situation.

**Notes:**

- Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
- Measurement uncertainty is ±5.0dB
- The reported field strength values are the worst case values at the indicated frequency. The EUT was varied in three positions, the antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
- A Quasi-peak detector was used with a resolution bandwidth of 120 kHz.
- The EUT was tested in passive mode (i.e. without a tag in its proximity). Maximum values have been noted.

Used test equipment and ancillaries:

99069	99070	99071	99107	99608	99609	99699	99547	15453
99580								

Test engineer

Signature : 

Name : Richard van der Meer  
 Date : November 15, 2011

#### 4.4 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field), EUT with AUX3 (PG39)

Frequency (kHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dB $\mu$ V @3m					dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
7565	64.4	Pk	19.5	1	40	44.9	60
8046	66.9	Pk	19.5	1	40	47.4	60
8571	68.1	Pk	19.5	1	40	48.6	60

Note:

Sweep stopped at lowest, middle and highest frequency

Table 4a Radiated emissions of the EUT in combination with AUX3, Peak values

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.223 and 15.35 with the EUT operating in continuous transmit mode, are depicted in Table 4a, 4b and 4c.

#### Notes:

1. Calculated measurement results are obtained by using the 40dB/decade extrapolation factor, antenna factor and cable loss. i.e at 8.50 MHz: 69.9dB $\mu$ V + 19.5dB + 1dB - 40dB= 50.4 dB $\mu$ V/m.
2. A resolution bandwidth of 9kHz was used during testing
3. Field strength values of radiated emissions at frequencies not listed in Table 4a and 4c are more than 20 dB below the applicable limit
4. The loop antenna was varied in horizontal and vertical orientations and also around it's axis. The reported value is the worst case found at the reported frequency.
5. The EUT was tested in passive mode (i.e. without a tag in its proximity). Maximum values have been noted.
6. Measurement uncertainty is  $\pm 5.0$ dB.

Used test equipment and ancillaries:

99069	99070	99107	99120	15453	99608	99609	99699	99699
99580								



Frequency (kHz)	Measurement results Peak	Detector	Correction factor	Measurement results (calculated Average)	Limits
	dB $\mu$ V @3m			dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
7565	44.9	Pk	-23.28	21.6	40.0
8046	47.4	Pk	-23.28	24.1	40.0
8571	48.6	Pk	-23.28	25.3	40.0

Note:  
Sweep stopped at lowest, middle and highest frequency

Table 4b Radiated emissions of the EUT in combination with AUX3, Average values

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dB $\mu$ V @3m					dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
10.0	38.1	Qp	19.7	1	40	18.8	40.0
11.0	33.7	Qp	19.7	1	40	14.4	29.5
15.1 - 17.2	9.8	Qp	19.7	1	40	-9.5	29.5

Note:  
Sweep stopped at lowest, middle and highest frequency

Table 4c Radiated emissions of the EUT in combination with AUX3, Quasi-Peak values

Test engineer

Signature : 

Name : Richard van der Meer

Date : November 15, 2011

#### 4.5 Radiated field strength measurements (30 MHz – 1 GHz, E-field), EUT with AUX4 (FL30)

Frequency (MHz)	Measurement results @3m Vertical (dBµV)	Measurement results @3m Horizontal (dBµV)	Correction factor (dB)	Results after correction Vertical (dBµV/m)	Results after correction Horizontal (dBµV/m)	Limits @3m (dBµV/m)	Pass/Fail
33.1	20.6	16.2	17.9	38.5	34.1	40.0	Pass
37.8 (l)	14.4	12.0	14.5	28.9	26.5	40.0	Pass
42.8 (h)	12.8	1.2	12.0	24.8	26.0	40.0	Pass
52.9 (l)	11.7	4.6	8.6	20.3	24.9	40.0	Pass
60.0 (h)	13.8	5.1	8.1	21.9	27.0	40.0	Pass
68.1 (l)	10.6	6.1	7.8	18.4	24.5	40.0	Pass
77.1 (h)	11.7	5.5	8.4	20.1	25.6	40.0	Pass
908.7	-2.8	-2.9	33.1	30.3	30.2	46.0	Pass

Note:

- (l): Sweep stopped at lowest frequency  
 (h): Sweep stopped at highest frequency

Table 5 Radiated emissions of the EUT

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209, are depicted in Table 5. The system is tested as a whole, so with all equipment as shown in Figure.1 in place and functioning. Being the worst case situation.


#### Notes:

- Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
- Measurement uncertainty is  $\pm 5.0$  dB
- The reported field strength values are the worst case values at the indicated frequency. The EUT was varied in three positions, the antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
- A Quasi-peak detector was used with a resolution bandwidth of 120 kHz.
- The EUT was tested in passive mode (i.e. without a tag in its proximity). Maximum values have been noted.

Used test equipment and ancillaries:

99069	99070	99071	99107	99608	99609	99699	99547	15453
99580								

Test engineer

Signature : 

Name : Richard van der Meer  
 Date : November 15, 2011

#### 4.6 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field), EUT with AUX4 (FL30)

Frequency (kHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dBµV @3m					dBµV/m@30m (unless otherwise stated)	dBµV/m@30m (unless otherwise stated)
7565	47.1	Pk	19.5	1	40	27.6	60
8046	51.1	Pk	19.5	1	40	31.6	60
8571	53.1	Pk	19.5	1	40	33.6	60

Note:

Sweep stopped at lowest, middle and highest frequency

Table 6a Radiated emissions of the EUT in combination with AUX4, Peak values

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.223 and 15.35 with the EUT operating in continuous transmit mode, are depicted in Table 6a, 6b and 6c.

#### Notes:

1. Calculated measurement results are obtained by using the 40dB/decade extrapolation factor, antenna factor and cable loss. i.e at 8.40 MHz: 53.7 dBµV + 19.5dB + 1dB - 40dB= 34.2 dBµV/m.
2. A resolution bandwidth of 9kHz was used during testing
3. Field strength values of radiated emissions at frequencies not listed in Table 6a and 6b are more than 20 dB below the applicable limit
4. The loop antenna was varied in horizontal and vertical orientations and also around it's axis. The reported value is the worst case found at the reported frequency.
5. The EUT was tested in passive mode (i.e. without a tag in its proximity). Maximum values have been noted.
6. Measurement uncertainty is ±5.0dB.

Used test equipment and ancillaries:

99069	99070	99107	99120	15453	99608	99609	99699	99699
99580								

Frequency (kHz)	Measurement results Peak	Detector	Correction factor	Measurement results (calculated Average)	Limits
	dB $\mu$ V @3m			dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
7565	27.6	Pk	-23.28	4.3	40.0
8046	31.6	Pk	-23.28	8.3	40.0
8571	34.0	Pk	-23.28	10.7	40.0

Note:

Sweep stopped at lowest, middle and highest frequency

Table 6b Radiated emissions of the EUT in combination with AUX4, Average values

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dB $\mu$ V @3m					dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
10.0	26.7	Qp	19.7	1	40	7.4	40
11.0	25.7	Qp	19.7	1	40	6.4	29.5
15.1 - 17.2	18.8	Qp	19.7	1	40	-0.5	29.5

Note:

Sweep stopped at lowest, middle and highest frequency

Table 6c Radiated emissions of the EUT in combination with AUX4, Quasi peak values

Test engineer

Signature :



Name : R. van der Meer

Date : November 09, 2011.

#### 4.7 Radiated field strength measurements (30 MHz – 1 GHz, E-field), EUT with AUX5 (FL45)

Frequency (MHz)	Measurement results @3m Vertical (dBµV)	Measurement results @3m Horizontal (dBµV)	Correction factor (dB)	Results after correction Vertical (dBµV/m)	Results after correction Horizontal (dBµV/m)	Limits @3m (dBµV/m)	Pass/Fail
33.1	6.4	-2.1	17.9	24.3	15.8	40.0	Pass
37.8 (l)	15.6	2.2	14.5	30.1	16.7	40.0	Pass
42.8 (h)	3.1	1.6	12.0	15.1	13.6	40.0	Pass
52.9 (l)	14.7	5.0	8.6	23.3	13.6	40.0	Pass
60.0 (h)	14.0	5.2	8.1	22.1	13.3	40.0	Pass
68.1 (l)	9.9	6.1	7.8	17.7	13.9	40.0	Pass
77.1 (h)	9.4	6.7	8.4	17.8	15.1	40.0	Pass
908.7	-2.8	-2.8	33.1	30.3	30.3	46.0	Pass

Note:

- (l): Sweep stopped at lowest frequency  
 (h): Sweep stopped at highest frequency

Table 7 Radiated emissions of the EUT

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209, are depicted in Table 7. The system is tested as a whole, so with all equipment as shown in Figure 1 in place and functioning. Being the worst case situation.


**Notes:**

- Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
- Measurement uncertainty is ±5.0dB
- The reported field strength values are the worst case values at the indicated frequency. The EUT was varied in three positions, the antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
- A Quasi-peak detector was used with a resolution bandwidth of 120 kHz.
- The EUT was tested in passive mode (i.e. without a tag in its proximity). Maximum values have been noted.

Used test equipment and ancillaries:

99069	99070	99071	99107	99608	99609	99699	99547	15453
99580								

Test engineer

Signature : 

Name : Richard van der Meer  
 Date : November 15, 2011

#### 4.8 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field), EUT with AUX5 (FL45)

Frequency (kHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dBµV @3m					dBµV/m@30m (unless otherwise stated)	dBµV/m@30m (unless otherwise stated)
7565	54.6	Pk	19.5	1	40	35.1	60
8046	54.2	Pk	19.5	1	40	34.7	60
8571	53.3	Pk	19.5	1	40	33.8	60

Note:

Sweep stopped at lowest, middle and highest frequency

Table 8a Radiated emissions of the EUT in combination with AUX5, Peak values

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.223 and 15.35 with the EUT operating in continuous transmit mode, are depicted in Table 8a, 8b and 8c.

#### Notes:

1. Calculated measurement results are obtained by using the 40dB/decade extrapolation factor, antenna factor and cable loss. i.e at 8.20 MHz: 55.5 dBµV + 19.5dB + 1dB - 40dB= 36.0 dBµV/m.
2. A resolution bandwidth of 9kHz was used during testing
3. Field strength values of radiated emissions at frequencies not listed in Table 6a and 6b are more than 20 dB below the applicable limit
4. The loop antenna was varied in horizontal and vertical orientations and also around it's axis. The reported value is the worst case found at the reported frequency.
5. The EUT was tested in passive mode (i.e. without a tag in its proximity). Maximum values have been noted.
6. Measurement uncertainty is ±5.0dB.

Used test equipment and ancillaries:

99069	99070	99107	99120	15453	99608	99609	99699	99699
99580								

Frequency (kHz)	Measurement results Peak	Detector	Correction factor	Measurement results (calculated Average)	Limits
	dB $\mu$ V @3m			dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
7565	35.1	Pk	-23.28	11.8	40.0
8046	34.7	Pk	-23.28	11.4	40.0
8571	33.8	Pk	-23.28	10.5	40.0

Note:  
Sweep stopped at lowest, middle and highest frequency

Table 8b Radiated emissions of the EUT in combination with AUX5, Average values

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dB $\mu$ V @3m					dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
10.0	18.1	Qp	19.7	1	40	-1.2	40
11.0	12.4	Qp	19.7	1	40	-6.9	29.5
15.1 - 17.2	4.5	Qp	19.7	1	40	-14.8	29.5

Note:  
Sweep stopped at lowest, middle and highest frequency

Table 8c Radiated emissions of the EUT in combination with AUX5, Quasi-Peak values

Test engineer

Signature : 

Name : R. van der Meer  
Date : November 09, 2011.

#### 4.9 Radiated field strength measurements (30 MHz – 1 GHz, E-field), EUT with AUX6 (EQ45-F)

Frequency (MHz)	Measurement results @3m Vertical (dB $\mu$ V)	Measurement results @3m Horizontal (dB $\mu$ V)	Correction factor (dB)	Results after correction Vertical (dB $\mu$ V/m)	Results after correction Horizontal (dB $\mu$ V/m)	Limits @3m (dB $\mu$ V/m)	Pass/Fail
33.1	7.5	-0.2	17.9	25.4	17.7	40.0	Pass
37.8 (l)	11.6	1.7	14.5	26.1	16.2	40.0	Pass
42.8 (h)	11.7	5.0	12.0	23.7	17.0	40.0	Pass
52.9 (l)	12.2	6.0	8.6	20.8	14.6	40.0	Pass
60.0 (h)	23.6	17.4	8.1	31.7	25.5	40.0	Pass
68.1 (l)	18.1	12.0	7.8	25.9	19.8	40.0	Pass
77.1 (h)	12.3	7.9	8.4	20.7	16.3	40.0	Pass
908.7	-0.3	-0.3	33.1	32.8	32.8	46.0	Pass

Note:

- (l): Sweep stopped at lowest frequency  
 (h): Sweep stopped at highest frequency

Table 7 Radiated emissions of the EUT

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209, are depicted in Table 7. The system is tested as a whole, so with all equipment as shown in Figure.1 in place and functioning. Being the worst case situation.

**Notes:**

6. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
7. Measurement uncertainty is  $\pm 5.0$ dB
8. The reported field strength values are the worst case values at the indicated frequency. The EUT was varied in three positions, the antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
9. A Quasi-peak detector was used with a resolution bandwidth of 120 kHz.
10. The EUT was tested in passive mode (i.e. without a tag in its proximity). Maximum values have been noted.

Used test equipment and ancillaries:

99069	99070	99071	99107	99608	99609	99699	99547	15453
99580								

Test engineer

Signature :



Name : Richard van der Meer  
 Date : February 03, 2011



#### 4.10 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field), EUT with AUX6 (EQ45-F)

Frequency (kHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dBµV @3m					dBµV/m@30m (unless otherwise stated)	dBµV/m@30m (unless otherwise stated)
7565	32.87	Pk	19.5	1	40	13.37	60
8046	30.29	Pk	19.5	1	40	10.79	60
8571	31.05	Pk	19.5	1	40	11.55	60

Note:

Sweep stopped at lowest, middle and highest frequency

Table 8a Radiated emissions of the EUT in combination with AUX6, Peak values

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.223 and 15.35 with the EUT operating in continuous transmit mode, are depicted in Table 8a, 8b and 8c.

#### Notes:

7. Calculated measurement results are obtained by using the 40dB/decade extrapolation factor, antenna factor and cable loss. i.e at 8.20 MHz:  $55.5 \text{ dB}\mu\text{V} + 19.5\text{dB} + 1\text{dB} - 40\text{dB} = 36.0 \text{ dB}\mu\text{V/m}$ .
8. A resolution bandwidth of 9kHz was used during testing
9. Field strength values of radiated emissions at frequencies not listed in Table 6a and 6b are more than 20 dB below the applicable limit
10. The loop antenna was varied in horizontal and vertical orientations and also around it's axis. The reported value is the worst case found at the reported frequency.
11. The EUT was tested in passive mode (i.e. without a tag in its proximity). Maximum values have been noted.
12. Measurement uncertainty is  $\pm 5.0\text{dB}$ .

Used test equipment and ancillaries:

99069	99070	99107	99120	15453	99608	99609	99699	99699
99580								

Frequency (kHz)	Measurement results Peak	Detector	Correction factor	Measurement results (calculated Average)	Limits
	dB $\mu$ V @3m			dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
7565	13.37	Pk	-23.28	-9.9	40.0
8046	10.79	Pk	-23.28	-12.4	40.0
8571	11.55	Pk	-23.28	-11.7	40.0

Note:  
Sweep stopped at lowest, middle and highest frequency

Table 8b Radiated emissions of the EUT in combination with AUX6, Average values

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dB $\mu$ V @3m					dB $\mu$ V/m@30m (unless otherwise stated)	dB $\mu$ V/m@30m (unless otherwise stated)
10.0	7.4	Qp	19.7	1	40	-11.9	40
11.0	5.8	Qp	19.7	1	40	-13.5	29.5
15.1 - 17.2	4.2	Qp	19.7	1	40	-15.1	29.5

Note:  
Sweep stopped at lowest, middle and highest frequency

Table 8c Radiated emissions of the EUT in combination with AUX6, Quasi-Peak values

Test engineer

Signature : 

Name : R. van der Meer  
Date : February 03, 2011.

## 5 Conducted emission data.

### 5.1 Conducted emission data of the EUT

Frequency (MHz)	Measurement results dB(µV) Neutral		Measurement results dB(µV) Line 1		Limits dB(µV)		Result
	QP	AV	QP	AV	QP	AV	
0.19864	46.2	Nm	46.9	Nm	64.0	54.0	Pass
0.19904	46.1	Nm	35.0	Nm	64.0	54.0	Pass
0.26358	39.6	Nm	39.9	Nm	61.4	51.4	Pass
0.33104	34.2	Nm	34.2	Nm	59.5	49.5	Pass
0.39590	26.8	Nm	27.6	Nm	58.0	48.0	Pass
0.46131	26.4	Nm	26.3	Nm	56.7	46.7	Pass
2.64440	21.2	Nm	23.9	Nm	56.0	46.0	Pass
3.10609	21.8	Nm	26.1	Nm	56.0	46.0	Pass
3.50190	20.4	Nm	27.6	Nm	56.0	46.0	Pass
4.42906	21.3	Nm	26.6	Nm	56.0	46.0	Pass
9.25180	39.2	Nm	40.6	Nm	56.0	46.0	Pass
9.31677	40.2	Nm	35.0	Nm	56.0	46.0	Pass
17.64578	31.2	Nm	35.6	Nm	56.0	46.0	Pass

Table 9 Conducted emission measurements

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.207, at the 120 Volts AC mains connection terminals of the AC/DC power supply which was connected to the EUT, are depicted in Table 9. Maximum values recorded. The system is tested as in whole, so with all equipment as shown in Figure.1 in place and functioning. Being the worst case situation.

**Notes:**

1. Measurement uncertainty is  $\pm 3.5$ dB
2. The resolution bandwidth used was 9 kHz.
3. The antenna was replaced by a 50 Ohm load as per KDB 174176
4. Nm = Not measured, since Qp values are already within Av limits.

Used test equipment and ancillaries:

99548	99161	12512	15667	13313		

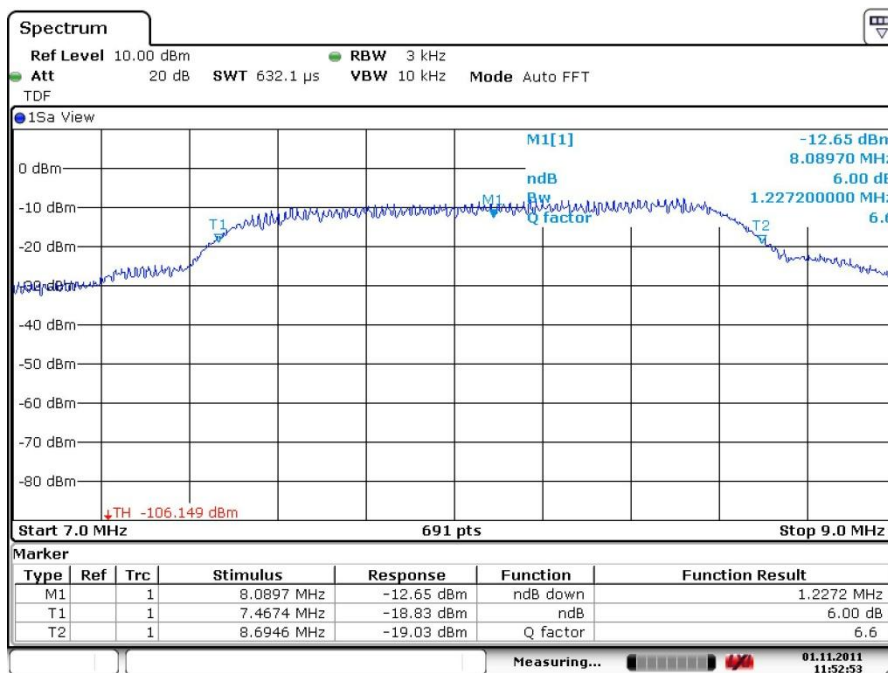
Test engineer

Signature : 

Name : R. van der Meer  
 Date : November 01, 2011

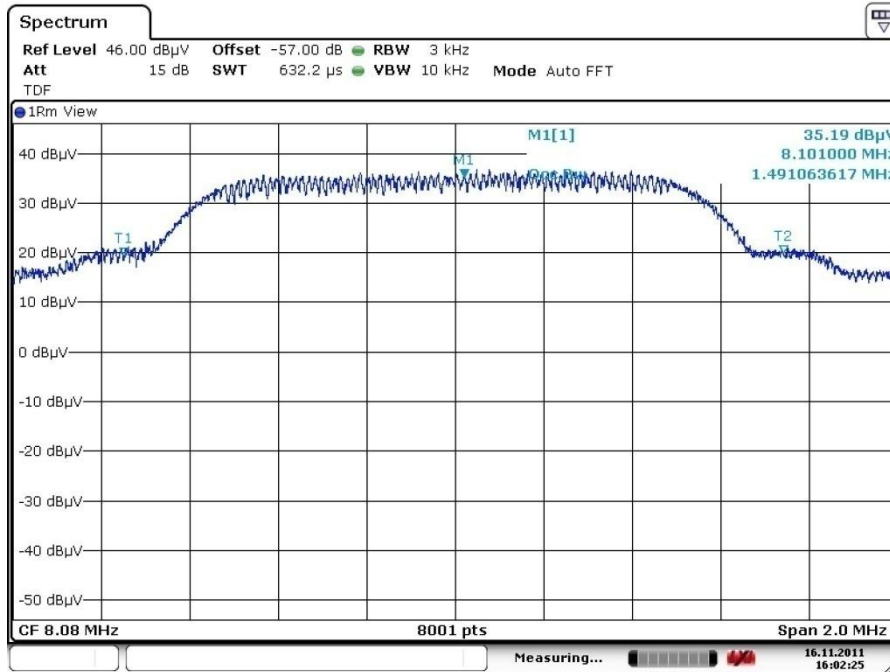
## 6 Plots of the emissions

The plot below shows compliance with the 47 CFR Part 15 section 15.223(a), this section requires the 6 dB emission bandwidth is more than 10% of the center frequency in order to allow a field strength of emissions of maximum 40 dB $\mu$ V/m (equal to 100  $\mu$ V/m). The center frequency of the EUT is stated at 8.2 MHz, therefore the 6dB bandwidth must be larger than 820 kHz. Plot 1 below, shows a 6dB bandwidth of: 1227.2 kHz.



Plot 1: 6 dB bandwidth is 1227.2 kHz, measured on a spectrum analyzer

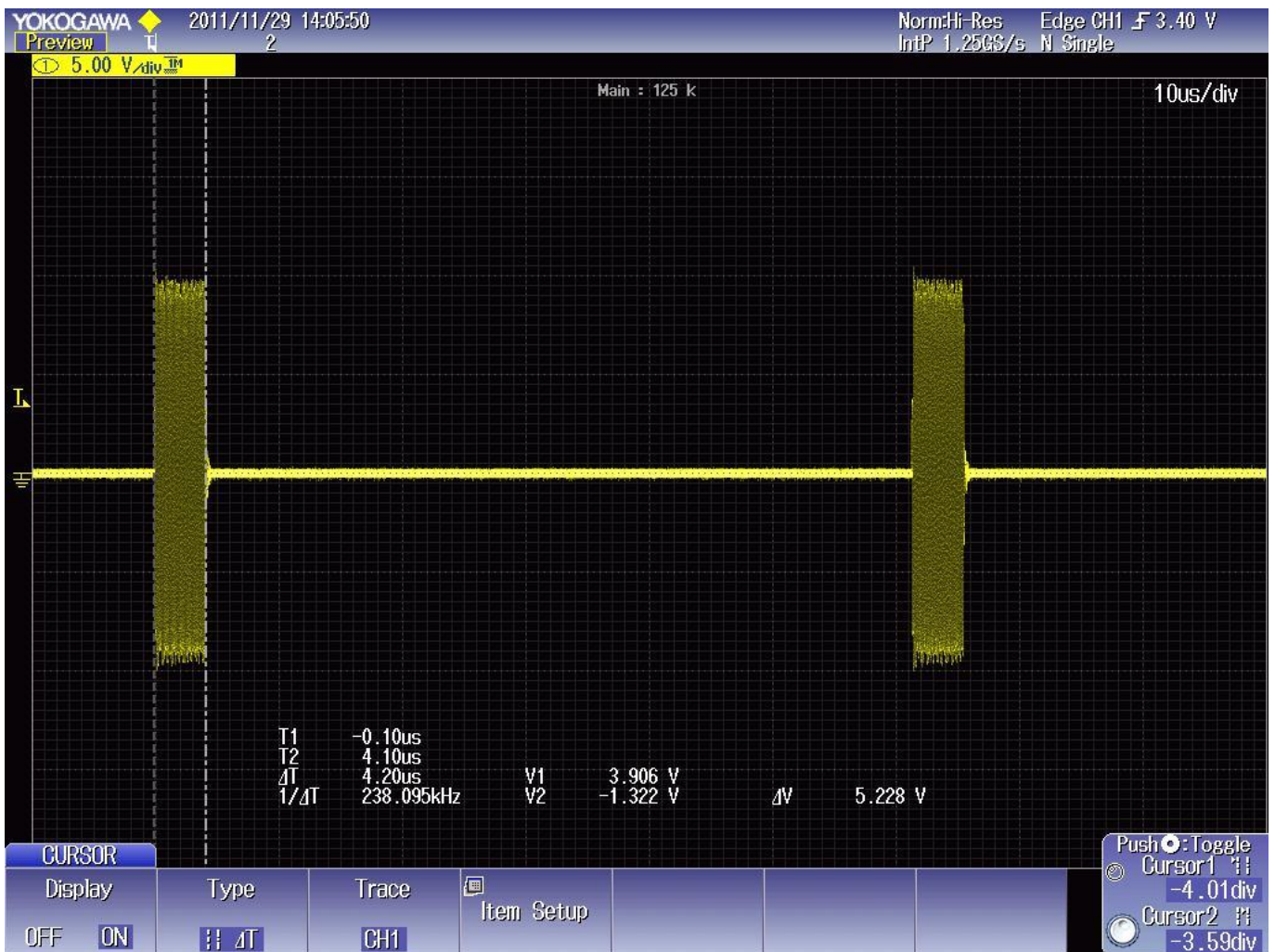
The plot below shows compliance with the 47 CFR Part 15 section 15.215(c), this section requires the 20 dB emission bandwidth is within the frequencyband designated in section 15.



Plot 2: Emission bandwidth is 1491.06 kHz, measured on a spectrum analyzer using the 20dB method.

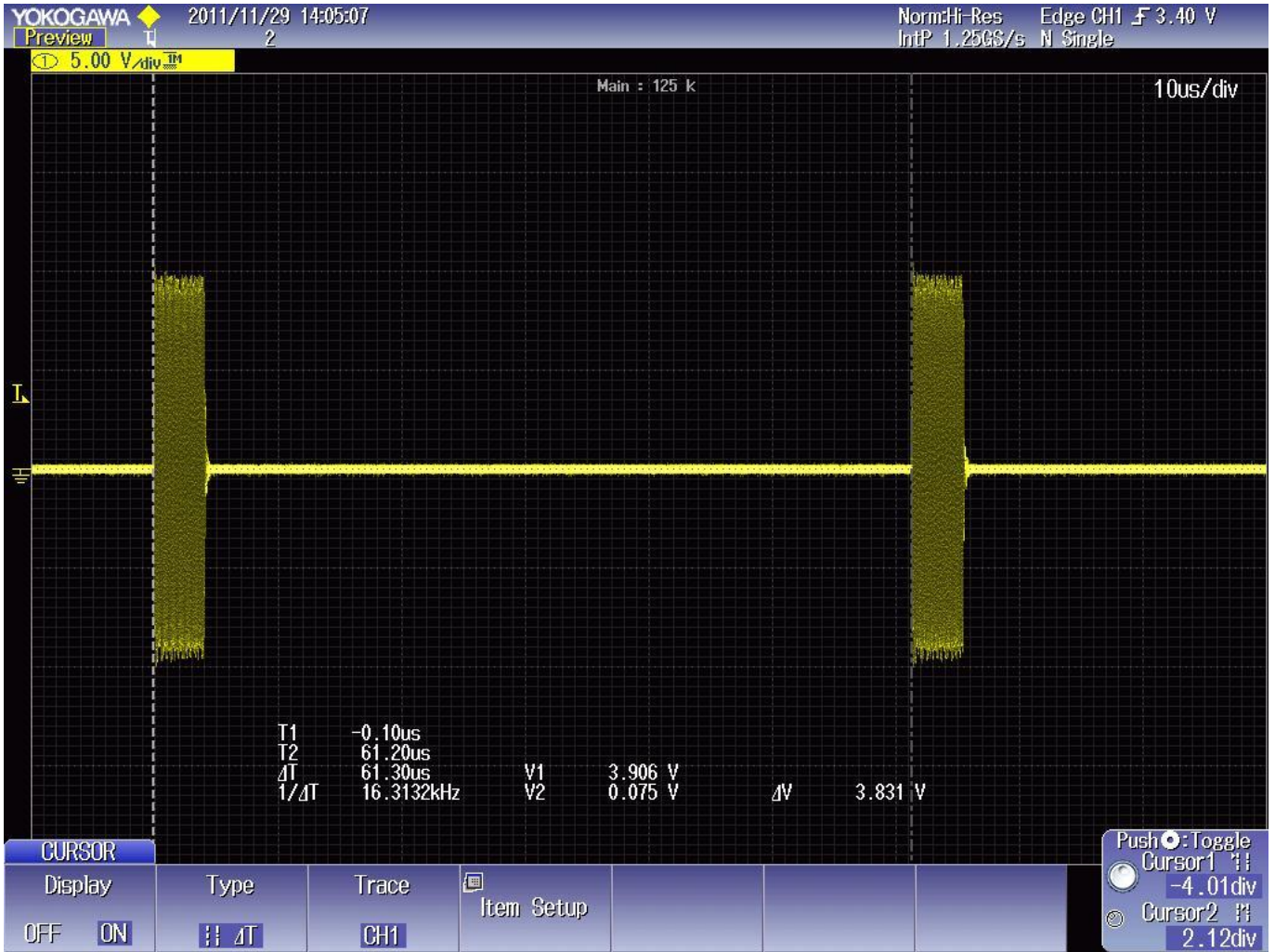
## 6.1 Duty Cycle correction

Plot 3a and 3b below show the RF On/Off characteristics of the EUT's emissions. From these characteristics a correction factor is calculated that is required to derive Average values from the measured Peak values of the emissions.



Plot 3a. RF On time of the signal as measured on a oscilloscope, measured value is 4.20 us.





Plot 3b. RF Off time of the signal as measured on an oscilloscope, measured value is 61.30 us

Duty cycle correction factor (Cf) = 20 Log (RF On time / Repetition rate)

$$Cf = 20 \text{ Log } (4.20 \text{ us} / 61.30 \text{ us}) = -23.28 \text{ dB}$$

## 7 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
12512	LISN	EMCO	3625/2	01/2010	01/2012
12476	Antenna mast	EMCO	TR3	NA	NA
12477	Antenna mast 1-4 mtr	Poelstra	NA	NA	NA
13313	Pulse Limiter	R&S	ESH3-Z2	02/2011	02/2012
15453	Active loopant. 60 cm	Chase	HLA6120	05/2011	05/2012
15633	Biconilog Testantenna	Chase	CBL 6111B	02/2011	02/2012
15667	Measuring receiver	R&S	ESCS30	10/2011	10/2012
99068	Crystal detector	Radiall	R451576000 detector	NA	NA
99069	Coax 5m RG213 OATS	NMi Certin B.V.	Cable 5M OATS	10/2011	10/2012
99070	Coax 15m RG213 OATS	NMi Certin B.V.	Cable 15M OATS	10/2011	10/2012
99071	Coax OATS ground	NMi Certin B.V.	Cable OATS	10/2011	10/2012
99106	Attenuator 20dB	Weinschel	24-20-43	12/2010	12/2012
99107	Controller OATS	Heinrich Deisel	4630-100	NA	NA
99161	Variac 250V 6A	RFT	LTS006	NA	NA
99547+99548	Temperature-Humiditymeter	Europe supplies	WS-7082	10/2011	10/2012
99580	OATS	Comtest	FCC listed: 90828	08/2011	08/2014
99608	Controller (OATS)	EMCS	DOC202	NA	NA
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99613	Temperature-Humiditymeter	Europe supplies	WS-7082	10/2011	10/2012
99651	Variac	NA	Vast Activa: 08-9510	NA	NA
99683	Loop antenna 6cm	NA	7405-901	09/2011	09/2012
99699	Measuring receiver	R&S	ESCI	02/2011	02/2012
99733	Spectrum analyzer	R&S	FSV	06/2011	06/2012
99769	Digital Oscilloscope	Yokogawa	710125 - DLM2052 2.5GS/s 500MHz	10/2011	10/2012

NA= Not Applicable