

**TEST REPORT CONCERNING THE COMPLIANCE OF AN  
BATTERY TAG FOR A  
COW POSITION SYSTEM,  
BRAND Nedap , MODEL NECK TAG CP ACT  
WITH 47 CFR PART 15 (10-1-12) AND THE  
REQUIREMENTS OF INDUSTRY CANADA:  
RSS-GEN (ISSUE 3, DECEMBER 2010) AND  
RSS-210 (ISSUE 8, DECEMBER 2010)**

**13012902.fcc03  
December 17, 2013**

FCC listed : 90828  
Industry Canada : 2932G-2  
R&TTE, LVD, EMC Notified Body : 1856

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**MEASUREMENT/TECHNICAL REPORT**

**Brand: Nedap**  
**Model: NECK TAG CP ACT**

**FCC ID: CGDNECKTAGCP**  
**IC: 1444A-NECKTAGCP**

This report concerns: Original grant/certification <del>Class 2 Permissive Change</del> <del>Verification</del>	
Equipment type:	DSC Remote Control Transmitter
Report prepared by:	Name : Richard van der Meer Company name : TÜV Rheinland EPS Address : Eiberkamp 10 Postal code/city : 9351VT / Leek Mailing address : P.O. Box 37 Postal code/city : 9350AA / Leek Country : The Netherlands Telephone number : + 31 594 505 005 Telefax number : + 31 594 504 804 E-mail : info@tuv-eps.com

The data taken for this test and report herein was done in accordance with 47 CFR Part 15 (10-1-12 edition) RSS-GEN (ISSUE 3, DECEMBER 2010), RSS-210 (ISSUE 8, DECEMBER 2010) and the measurement procedures of ANSI C63.4-2009. TÜV Rheinland EPS B.V. at Leek, 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: December 17, 2013

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 (EUT) : Battery Tag for a Cow Positioning System  
Manufacturer : N.V. Nederlandsche Apparatenfabriek "Nedap"  
Brand : Nedap  
Model(s) : NECK TAG CP ACT  
Serial number(s) : --  
Receipt date : November 07, 2013


### Applicant information


Applicant's representative : Mr. J. Hulshof  
Company : N.V. Nederlandsche Apparatenfabriek "Nedap"  
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Postal code : 7141 DC  
City : Groenlo  
Country : The Netherlands  
Telephone number : +31 544 471 162  
Telefax number : +31 544 463 475

### Test(s) performed

Location : Leek  
Test(s) started : November 07, 2013  
Test(s) completed : December 06, 2013  
Purpose of test(s) : Equipment Authorization (Original grant/certification)

Test specification(s) : 47 CFR Part 15 (10-1-12 edition) and  
RSS-GEN (ISSUE 3, DECEMBER 2010) AND  
RSS-210 (ISSUE 8, DECEMBER 2010)

Test engineer(s) : R. van der Meer 

Report written by : R. van der Meer 

Report date : December 17, 2013

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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 battery Tag for a Cow Positioning System, brand Nedap, model NECK TAG CP ACT in the frequencyband 433.3 MHz – 434.5 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 certification in equipment authorization files under registration number.  
**FCC ID: CGDNECKTAGCP and IC: 1444A-NECKTAGCP.**

### 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	:	Battery Tag for a Cow Positioning System
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand	:	Nedap
Model	:	NECK TAG CP ACT
Serial number	:	--
Voltage input rating	:	3.6 V Battery powered
Voltage output rating	:	n.a.
Current input rating	:	--
Antenna	:	External
Operating frequency	:	433.3 – 434.5 MHz Channel 1: 433.3 MHz Channel 2: 433.6 MHz Channel 3: 433.8 MHz Channel 4: 434.0 MHz Channel 5: 434.2 MHz Channel 6: 434.5 MHz
Modulation	:	FSK
Remarks	:	n.a.



Photo 1. Photograph of the tested sample

### 1.3.1 Special Accessories and Auxiliary Equipment

For testing no additional accessories: were used.

### 1.3.2 Description of input and output ports.

The EUT has no input and output ports, is battery powered and has an internal antenna.

### 1.4 Test summary

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

Test Standard		Description	Page	Pass / Fail / Not Applicable
47 CFR Part 15 (10-1-12 Edition)	RSS-210 Issue 8, December 2010			
15.207(a)	RSS-Gen(7.2.4)	Conducted emissions	--	Not Applicable
15.209, 15.231(e)*	RSS-Gen(4.9 and 7.2.5) and RSS-210(2.5)	Radiated emissions	9 - 12	Pass
15.215(c)	RSS-Gen(4.6.1)	Bandwidth of the emission	14 - 18	Pass
15.231(e)*	RSS-210 (A.1.1.5)	RF on/off time	19 - 20	Pass

Table: Test specifications

Testmethods: ANSI C63.4:2009, RSS-Gen Issue 3, December 2010 and RSS-210 annex A section A1.1.5 and Table B limits.

## 1.5 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (10-1-12)), sections 15.31, 15.35, 15.205, 15.209, 15.231 and RSS-GEN (ISSUE 3, DECEMBER 2010) RSS-210 (ISSUE 8, DECEMBER 2010).

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

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, located in Leek, 9351VT Eiberkamp 10, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948.

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-2. 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	: EUT is battery powered only
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 EUT was not modified for testing purposes.

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 modulated transmit mode, i.e. the EUT is transmitting while continuously transmitting data. All test set ups have been documented in pictures in the documentation package which will be submitted to the Commission.

### **2.3 Test frequencies**

Measurements are made with the EUT set to 3 frequencies in it's operating range, 1 near the bottom (433.3 MHz), 1 near the center (433.8 MHz) and 1 near the top (434,5 MHz).

### **2.4 Testsoftware**

No Testsoftware was required for testing.

### **2.5 Special accessories.**

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

### **2.6 Equipment modifications.**

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

### **2.7 Product Labeling**

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

### **2.8 Block diagram of the EUT.**

The block diagram is available in the technical documentation package.

### **2.9 Schematics of the EUT.**

The schematics are available in the technical documentation package.

### **2.10 Part list of the EUT.**

The part list is available in the technical documentation package.



### 3 Radiated emission data.

**RESULT: Pass**

Date of testing: 2013-11-07  
Frequency range: 30MHz - 4.35GHz

Requirements:

FCC 15.205, FCC 15.209, FCC 15.231(e) and IC RSS-Gen(4.9, 7.2.2 and 7.2.5) and RSS-210(2.5)

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a).

Test procedure:

ANSI C63.4-2009.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30MHz to the 10th harmonic of the highest fundamental transmitter frequency. Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

Correction factors are incorporated in the spectrum analyzers as an automated function.  
Correction factors includes: antenna factor, cable loss and pre-amplifier gain.

### 3.1 Radiated field strength measurements (30 MHz – 4.35 GHz, E-field)

Frequency (MHz)	Detector	Polarization	Results @3m (dBµV/m)	Limits @3m (dBµV/m)	Pass/Fail
175.080	Qp	Horizontal	16.0	46.0	Pass
252.300	Qp	Horizontal	20.0	46.0	Pass
379.293	Qp	Horizontal	22.7	46.0	Pass
Fundamentals:					
433.30	Pk	Vertical	86.1	92.86	Pass
433.80	Pk	Vertical	90.0	92.87	Pass
434.50	Pk	Vertical	85.5	92.88	Pass
Harmonics:					
866.60	Qp	Horizontal	34.0	46.0	Pass
867.60	Qp	Vertical	35.4	46.0	Pass
869.00	Qp	Vertical	34.1	46.0	Pass
Frequency (MHz)	Detector	Polarization	Results Pk @3m (dBm eirp)	Limits @3m (dBm eirp)*	Pass/Fail
1735	Pk	Vertical	-56.2	-21.2 Pk/ -41.2 Av	Pass
1959	Pk	Horizontal	-56.8	-21.2 Pk/ -41.2 Av	Pass
2337	Pk	Horizontal	-50.4	-21.2 Pk/ -41.2 Av	Pass
4339	Pk	Vertical	-55.7	-21.2 Pk/ -41.2 Av	Pass

\*Derived from the expression dBm eirp= E (dBµV/m) – 95.2 dB

Table 1 Radiated emissions of the EUT.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.205, 15.209, 15.231(e), RSS-210 (Annex 1) and RSS-Gen (4.9, 7.2.2 and 7.2.5) are depicted in Table 1. See notes on page 11.

**Notes:**

1. Field strength values of radiated emissions at frequencies not listed in the Table 1 above are more than 20 dB below the applicable limit.
2. The frequencies of 252.3 MHz, 2337 MHz and 4339 MHz fall within a restricted band as specified in section 15.205. Therefore the limit specified in section 15.209 has been applied.
3. Measurements were performed up to the 10th harmonic of the transmit frequency of 434.5 MHz.
4. A resolution bandwidth of 120 kHz was used below 1000 MHz.
5. Above 1000 MHz a Peak detector was used with a bandwidth of 1 MHz.
6. Where measured Peak values were below the Average limit by at least 3dB, measurement with Average detector was not performed.
7. Measurement uncertainty is  $\pm 5.0$ dB.

Used test equipment and ancillaries:

99580/99847	99855	99877	12483	99608	99609	99699		

### 3.2 Radiated field strength measurements (30 MHz – 4.35 GHz, E-field), Average values

Frequency (MHz)	Measurement results @3m (dBµV)	Polarization	Detector	Duty Cycle Correction factor (dB)	Results after correction (dBµV/m)	Limits @3m (dBµV/m)	Pass/ Fail
Fundamentals:							
433.30	86.1	Vertical	Av	-20.17	65.93	72.86	Pass
433.80	90.0	Vertical	Av	-20.17	69.83	72.87	Pass
434.50	85.5	Vertical	Av	-20.17	65.33	72.88	Pass

Table 2 Radiated emissions of the EUT, Average values.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.35, 15.205, 15.209, 15.231, RSS-210 and RSS-Gen are depicted in Table 2.

**Notes:**

1. Table 2 show calculated average values from the pulsed emissions measurement data from section 3.1 Peak values, corrected with the worst case duty cycle factor over 100 msec (see Note 2 on this page).
2. The values noted in Table 2 are after application of a duty cycle correction, according to part 15.35c of – 20.17 dB. Duty cycle calculated from: Duty cycle correction (dB) = 20 log (9.8 msec / 100 msec) = -20.17 dB. See page 19 of this document for the RF On-time of 9.8 msec.

## 4 Conducted emission data.

### 4.1 AC Power Line Conducted Emission data of the EUT.

**RESULT: Not Applicable, EUT is battery operated only.**

Date of testing: --

## 5 Plots of measurement data

### 5.1 Bandwidth of the emission

**RESULT: PASS**

Date of testing: 2013-11-09

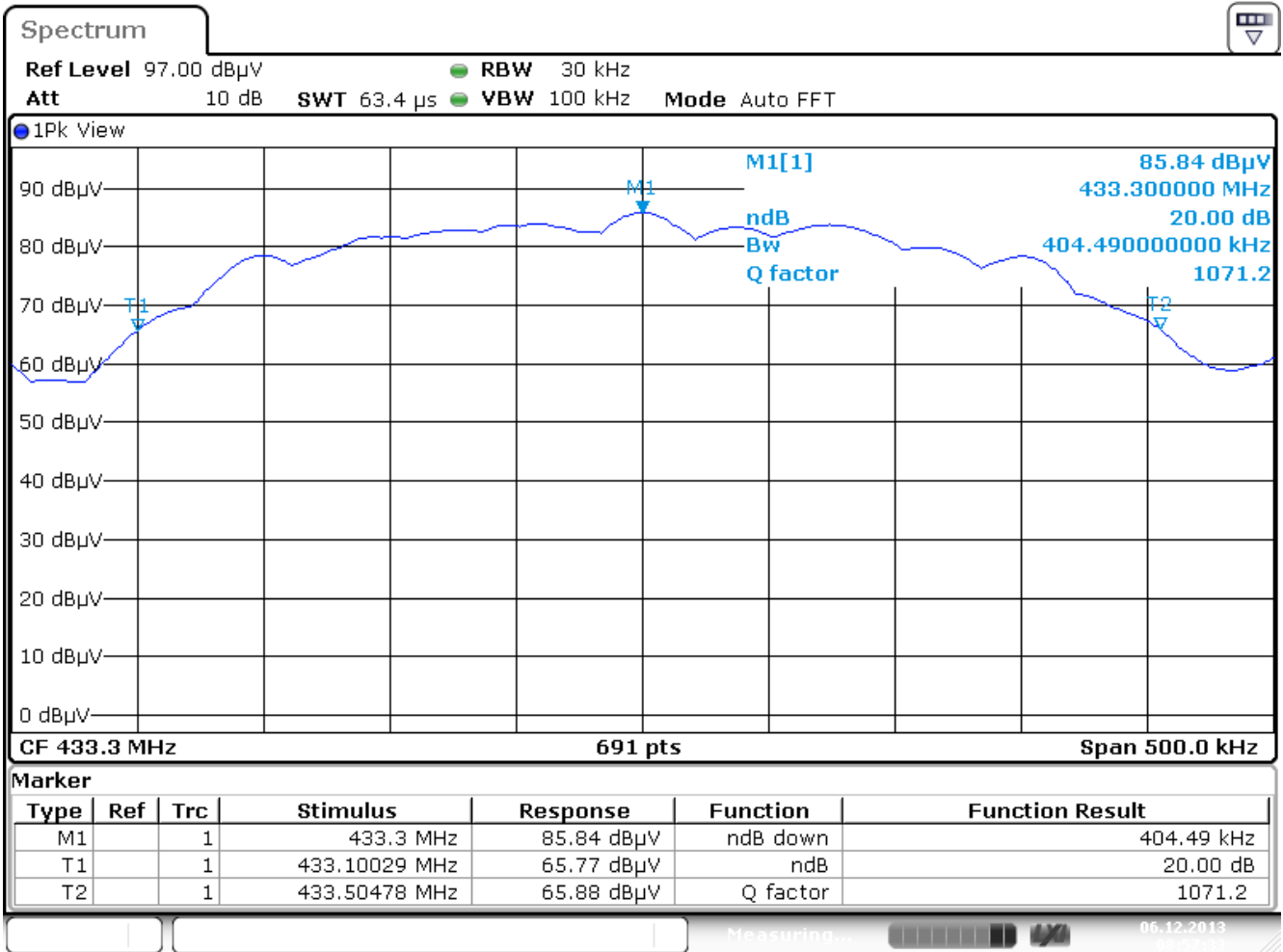
Requirement:

The bandwidth of emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier. For this EUT operating at the lowest operating frequency of 433.60 MHz (Channel 1) the allowable bandwidth of emissions would be:

$$0.25\% * 433.30 \text{ MHz} = 1083.25 \text{ kHz.}$$

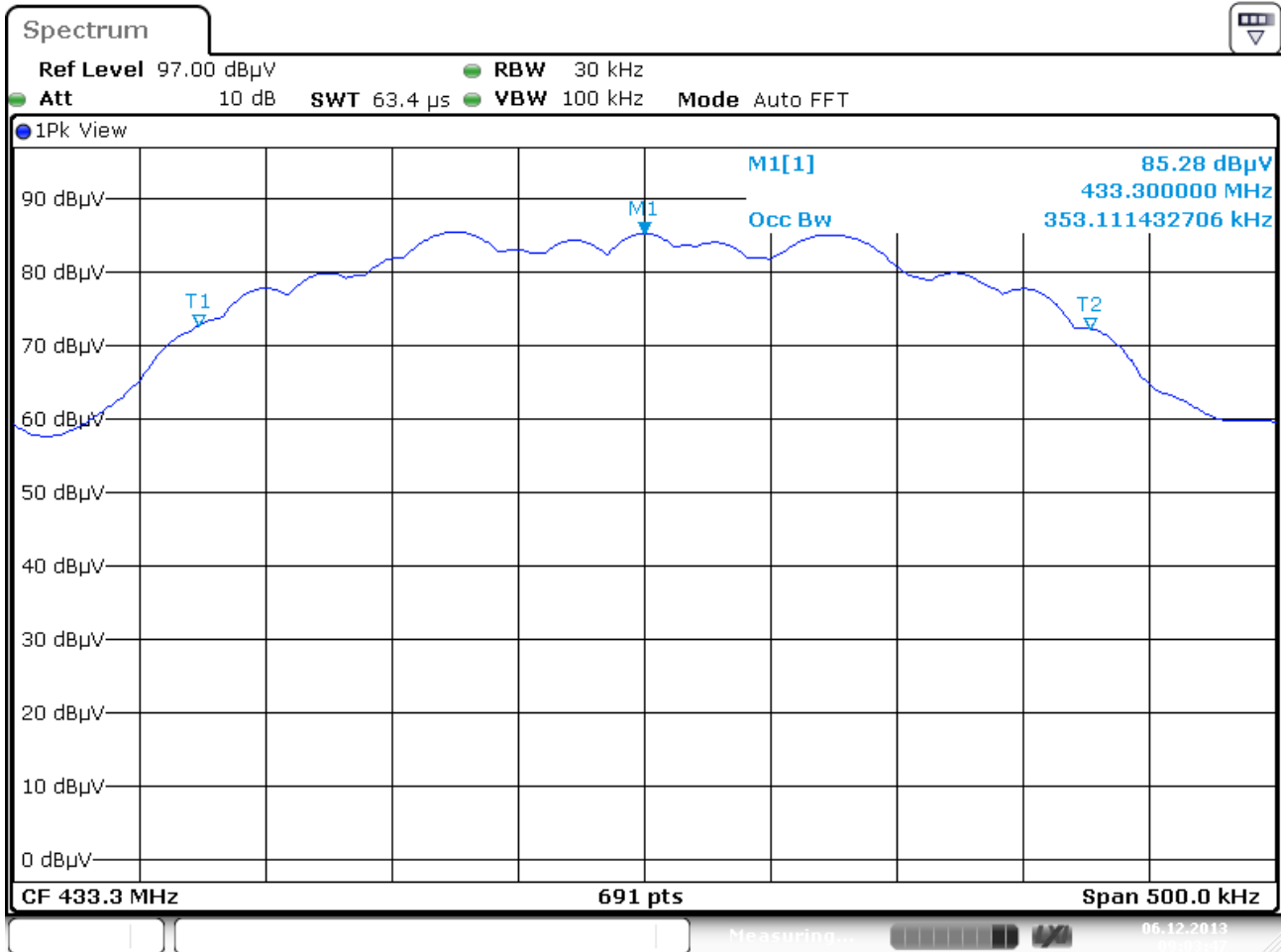
Testresult:

The measured bandwidth of the emissions as measured with a spectrum analyzer was: **404.49 kHz** (see Plot1a on the next page). The test was performed on a modified EUT, where constant transmission was enabled.



Date: 6.DEC.2013 08:57:32

Plot1a: plot of the emission at Channel 1. Measured value is 404.49 kHz as measured on a spectrum analyzer.



Date: 6.DEC.2013 09:03:47

Plot1b: plot of the 99% emission bandwidth Channel 1. Measured value is 398.7 kHz as measured on a spectrum analyzer.

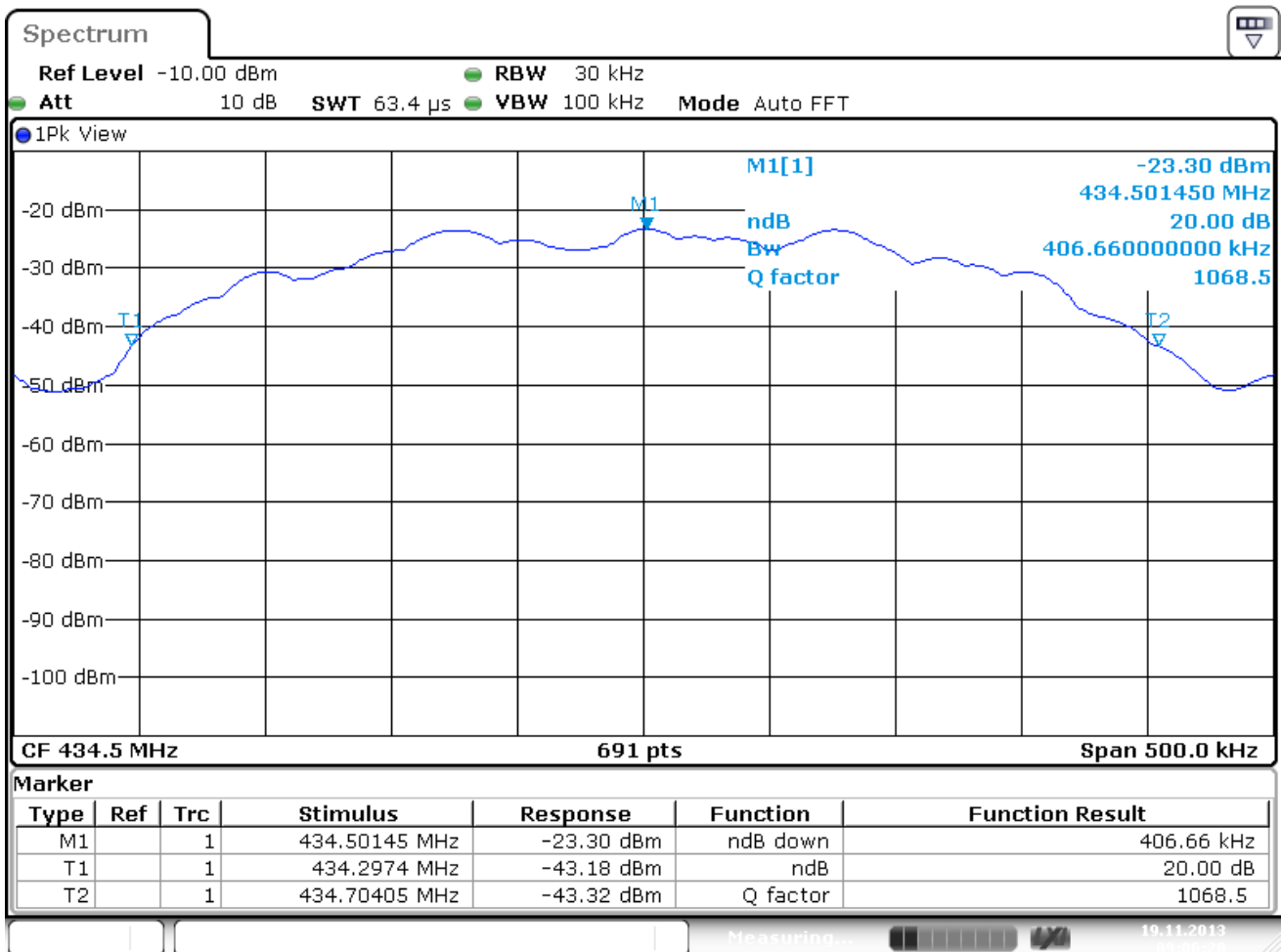


Requirement:

For this EUT operating at the highest operating frequency of 434.50 MHz (Channel 6) the allowable bandwidth of emissions would be:  
 $0.25\% * 434.50 \text{ MHz} = 1086.25 \text{ kHz}$ .

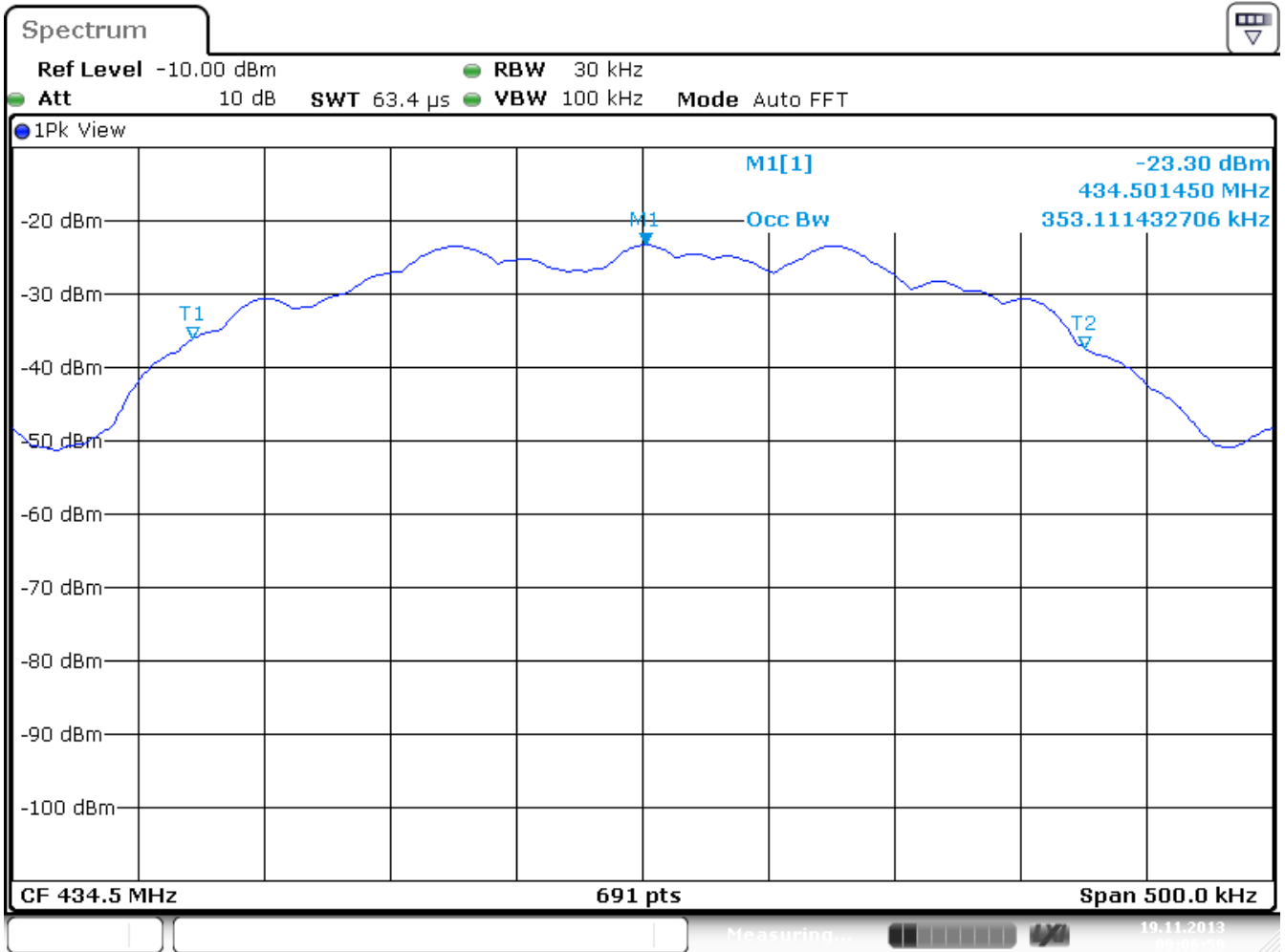
Testresult:

The measured bandwidth of the emissions as measured with a spectrum analyzer was: **406.66 kHz** (see Plot2a).  
 The test was performed on a modified EUT, where constant transmission was enabled.



Date: 19.NOV.2013 09:06:20

Plot2a: plot of the emission at Channel 4. Measured value is 406.66 kHz as measured on a spectrum analyzer.



Date: 19.NOV.2013 09:06:59

Plot 2b: plot of the 99% emission bandwidth Channel 4. Measured value is 353.11 kHz as measured on a spectrum analyzer.

## 5.2 RF On time

**RESULT: PASS**

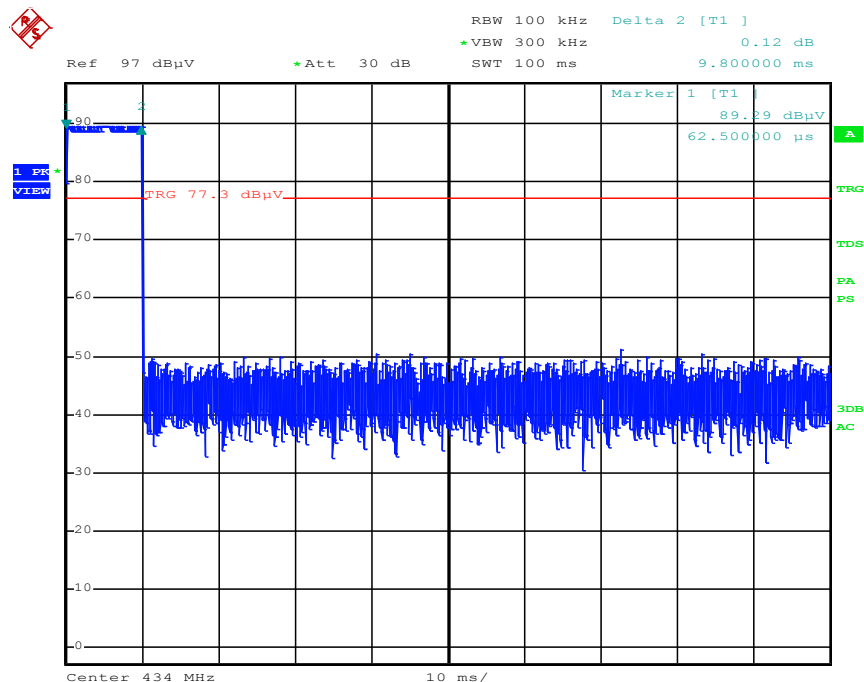
Date of testing: 2013-11-07 and 2013-11-20

Requirement:

The duration of each transmission is confined within 1 second, and the required silent period is at least 10 seconds or 30 times the duration of transmissions according to 15.231(e) and RSS-210 (Annex A1.1.5).

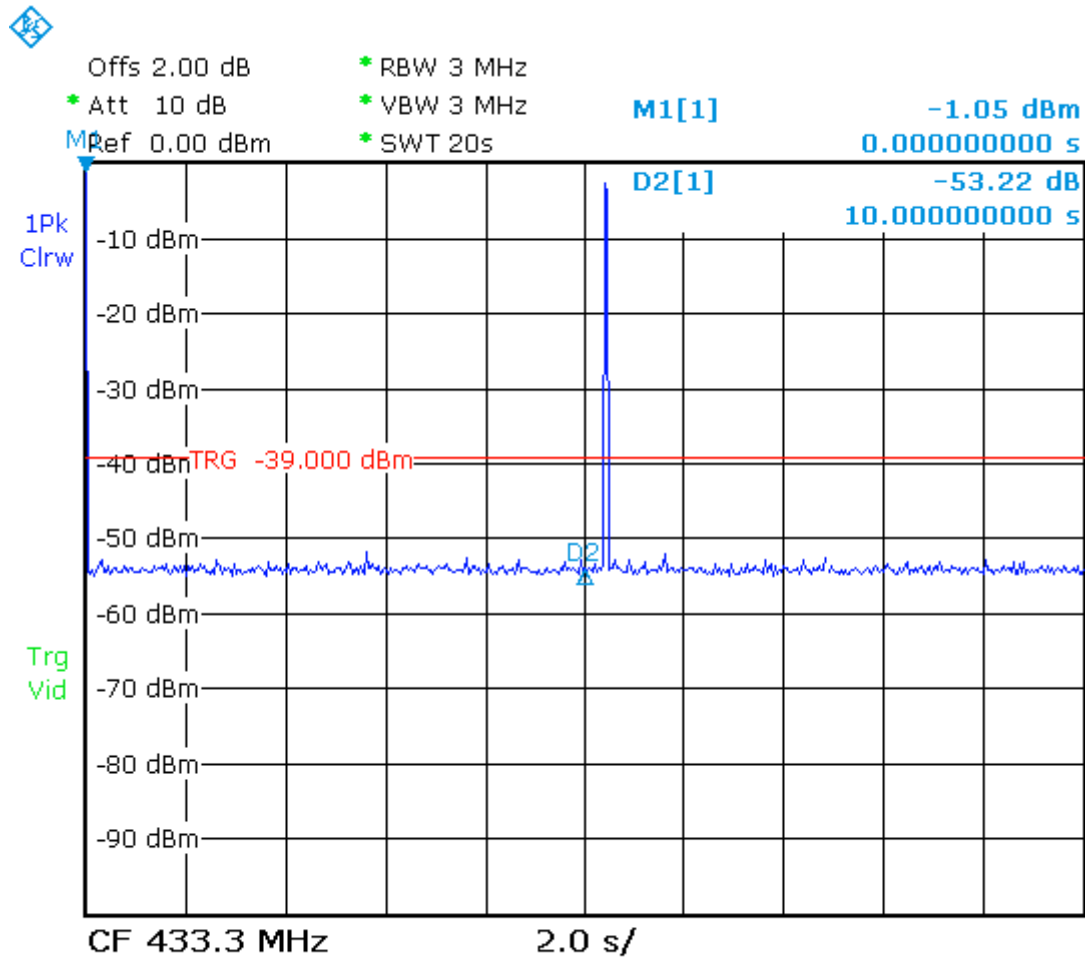
Testresult:

Plot 3 below shows the EUT's RF On Time. Plot 4 on page 21 shows that the time between transmissions is more than 30 times the RF On time and far more than 10 seconds.  
 The RF On time in 100 ms is: 9.8 ms.



Date: 7.NOV.2013 11:26:16

Plot 3: RF On Time of the transmitter as measured on a spectrum analyzer.



Date: 20.NOV.2013 11:06:56

Plot 4: RF Off Time as measured on a spectrum analyzer.

The RF Off time is more than 10 seconds as required by section 15.231(e) as shown in plot 4 above where the RF On is indicated with marker 1. Marker D2 indicates the 10 seconds period, while the whole plot covers 20 seconds.

## 6 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
12483	Guide horn antenna	Emco	3115	04/2013	04/2014
12512	LISN FCC 50 uH / 50 ohm	Emco	3725/2	01/2012	01/2014
13313	Pulse limiter	R&S	ESH3-Z2	01/2013	01/2014
99161	Variac 250V 6A	RFT	LTS006	NA	NA
99848	Shielded room for Conducted emissions	--	--	NA	NA
99877	Biconilog Testantenna	Teseq	CBL 6111D	06/2013	06/2014
99861	Turntable controller	Maturo	SCU/088/8090811	NA	NA
99733	Spectrum analyzer	R&S	FSV	05/2013	05/2014
99852/ 99855/ 99857	Temperature-Humiditymeter	EXtech	SD500	02/2013	02/2014
99580/ 99847	Test facility	Comtest	FCC listed: 90828 IC listed: 2932G-2	12/2011	12/2014
99608	Controller	EMCS	DOC202	NA	NA
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99699	Measuring receiver	R&S	ESCI	03/2013	03/2014
99858	RF Cable S-AR	Gigalink	APG0500	01/2013	01/2014

NA= Not Applicable