

<b>Prüfbericht-Nr.:</b> Test Report No.:	19041501.r01	<b>Auftrags-Nr.:</b> Order No.:	89215410	Seite 1 von 23 Page 1 of 23
<b>Kunden-Referenz-Nr.:</b> Client Reference No.:	POC-LM000041	<b>Auftragsdatum:</b> Order date:	28.05.2019	
<b>Auftraggeber:</b> Client:	Nedap N.V., Parallelweg 2 7141 DC Groenlo, Netherlands, A. Haytema (Nedap Livestock Management)			
<b>Prüfgegenstand:</b> Test item:	433.6 - 434.2 MHz active RFID Tag Transmitter Farrowing Trigger sensor			
<b>Bezeichnung / Typ-Nr.:</b> Identification / Type No.:	VP4011			
<b>Auftrags-Inhalt:</b> Order content:	Compliance with regulatory requirements			
<b>Prüfgrundlage:</b> Test specification:	FCC 47 CFR Part 15, Subpart C, Section 15.247 (10-1-18 Edition) RSS-Gen (Issue 5, March 2019 (Amendment 1)) and RSS-210 (Issue 9, August 2016) ANSI C63.10-2013			

<b>Wareneingangsdatum:</b> Date of receipt:	12.06.2019	
<b>Prüfmuster-Nr.:</b> Test sample No.:	D000000069	
<b>Prüfzeitraum:</b> Testing period:	12.07.2019 - 26.07.2019	
<b>Ort der Prüfung:</b> Place of testing:	Leek	
<b>Prüflaboratorium:</b> Testing laboratory:	TÜV Rheinland Nederland B.V. Leek Laboratory	
<b>Prüfergebnis*:</b> Test result*:	Pass	

geprüft von / tested by:	Kontrolliert von / reviewed and apporoved by:				
26.11.2019 R. van der Meer/Test Eng.	26.11.2019 E. vd Wal/Senior Eng.				
Datum	Name / Stellung	Unterschrift	Datum	Name / Stellung	Unterschrift
Date	Name / Position	Signature	Date	Name / Position	Signature
Sonstiges / Other:	-				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged				
<p>* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getested</p> <p>Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. Test specification(s) F(ail) a.m. test specification(s) N/A = not applicable N/T = not tested</p> <p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the above mentioned testsample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This report does not entitle to carry any test mark</p>					

**Liste der verwendeten Prüfmittel**  
***List of used test equipment***

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing.  
NA= Not Applicable

Prüfmittel Kind of Equipment	Hersteller / Manufacturer	Bezeichnung / Model Name	Prüfmittel- Nr. / ID-Nr. Equipment No. / ID-No.	Kalibrierung Calibration (mm/yyyy)	Nächste Kalibrierung Next calibration (mm/yyyy)
<b>For Radiated Emissions</b>					
Measurement Receiver	Rohde & Schwarz	ESCI	A00314	03/2019	03/2020
RF Cable S-AR	Gigalink	APG0500	A00447	03/2019	03/2020
Controller	Maturo	SCU/088/ 8090811	A00450	N/A	N/A
Controller	EMCS	DOC202	A00257	N/A	N/A
Test facility	Comtest	FCC listed: 786213 IC: 2932G-2	A00235	03/2018	03/2020
Spectrum Analyzer	Rohde & Schwarz	FSV	A00337	07/2018	08/2020
Antenna mast	EMCS	AP-4702C	A00258	N/A	N/A
Temperature- Humiditymeter	Extech	SD500	A00444	06/2018	06/2020
Biconilog Testantenna	Teseq	CBL 6111D	A00466	10/2018	10/2019

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing. NA= Not Applicable

**Accreditation**

The reported tests were performed under ISO17025:2005 accreditation, unless otherwise specified as 'not under Accreditation'

An overview of all TÜV Rheinland Nederland B.V. accreditations, notifications and designations, please visit our website [www.tuv.com/nl](http://www.tuv.com/nl). You can find the relevant declarations under the download link

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Test report No:

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**Produktbeschreibung**  
**Product description**

1	<b>Produktdetails</b> <i>Product details</i>	The <b>Farrowing Trigger</b> is an active Radio Frequency Identification (RFID) tag for individual pig on demand feed .
2	<b>Maße / Gewicht</b> <i>Dimensions / Weight</i>	H x W x D = 150 x 55 x 40mm
3	<b>Bedienelemente</b> <i>Operating elements</i>	None
4	<b>Ausstattung / Zubehör</b> <i>Equipment / Accessories</i>	None
5	<b>Verwendete Materialien</b> <i>Used materials</i>	None
6	<b>Sonstiges</b> <i>Other</i>	None



<b>Revisions</b> <i>Revisions</i>			
<b>Revision</b> Revision	<b>Datum</b> Date	<b>Anmerkung</b> Remark	<b>Verfasser</b> Author
-	29.07.2019	First release	R. van der Meer
01	19.09.2019	corrected used spectrum analyzer, changed power setting details and typos. Plot Off time added.	R. van der Meer
02	14.11.2019	Corrected RSS-Gen version	R. van der Meer
03	26.11.2019	removed incorrect plots	R. van der Meer

Note: Latest revision report will replace all previous reports

### Measurement Uncertainty

<b>Measurement Type</b>	<b>Frequency</b>	<b>Uncertainty</b>
Radiated Emission	30MHz – 4.5GHz	±5.22 dB

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## 1 General information.

### 1.1 Tested system details.

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

EUT	:	Farrowing Trigger
Manufacturer	:	Nedap N.V.
Brand	:	Nedap
Model	:	VP4011
Antenna	:	Internal
Operating frequency	:	433.60 – 434.20 MHz Channel 1: 433.6 MHz Channel 2: 433.8 MHz Channel 3: 434.0 MHz Channel 4: 434.2 MHz
Modulation	:	FSK
Power setting	:	20 (no unit provided, designated as Transmit Power in the test software, see section 2.4.1 screenshot)

#### 1.1.1 Description of input and output ports.

The EUT is battery operated only and there are no actual input and output ports present.

### 1.2 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 (10-1-18 Edition)	RSS-210 Issue 9, August 2016			
15.207(a)	RSS-Gen(8.8)	AC power line Conducted emissions	18	Not Applicable
15.209, 15.231(e)*	RSS-Gen(8.9) and RSS-210(A.1.4)	Radiated emissions	9 - 17	Pass
15.215(c)	RSS-Gen(6.7)	Bandwidth of the emission	19 - 22	Pass
15.231(e)*	RSS-210 (A.1.4)	RF on/off time	23 - 24	Pass

Table: Test specifications

### 1.3 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (10-1-18), sections 15.31, 15.35, 15.205, 15.209, 15.231(e) and RSS-GEN (ISSUE 5, MARCH 2019 (AMENDMENT 1)) AND RSS-210 (ISSUE 9, AUGUST 2016).

The test methods, which have been used, are based on ANSI C63.10: 2013.

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.

### 1.4 Test facility.

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland, 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 NL0005 (test site registration number) 786213. 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 NL0002 (test site registration 2932G). The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

### 1.5 Test conditions.

Normal test conditions:

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: 3.0 V <sub>DC</sub> battery powered (new battery used during testing)
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.*

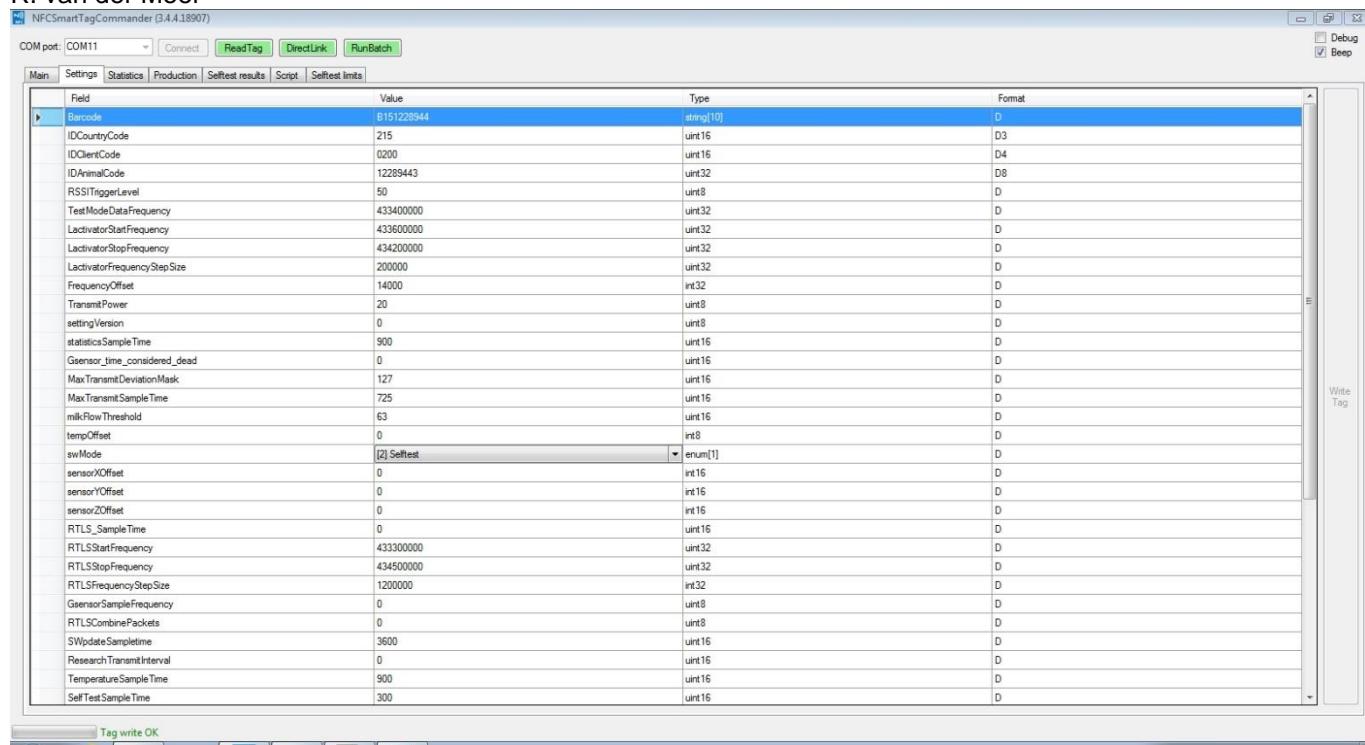
## 2 System test configuration.

### 2.1 Justification.

An EUT was supplied with programmer and test software (screenshot shown below) which enabled a constant transmit mode for testing purposes. All tests were done with a new fully loaded battery. EUT is tested in vertical position only, it's only use position.

Test software: NFCSmartTagCommander v 3.4.4.18907

R. van der Meer



The screenshot shows the NFCSmartTagCommander software interface. The main window displays a table of configuration parameters with columns for Field, Value, Type, and Format. The 'Format' column for most entries shows 'D' (Decimal). The 'Type' column includes string[10] for the Barcode field, and various uint16, uint32, and int32 types for other fields. The table lists numerous parameters such as IDCountryCode, IDClientCode, IDAnimalCode, RSSTriggerLevel, TestModeDataFrequency, LactivatorStartFrequency, LactivatorStopFrequency, LactivatorFrequencyStepSize, FrequencyOffset, TransmitPower, settingVersion, statisticsSampleTime, Gsensor\_time\_considered\_dead, MaxTransmitDeviationMask, MaxTransmitSampleTime, milkFlowThreshold, tempOffset, swMode, sensorXOffset, sensorYOffset, sensorZOffset, RTLS\_SampleTime, RTLSStartFrequency, RTLSStopFrequency, RTLSFrequencyStepSize, GsensorSampleFrequency, RTLSCombinePackets, SWUpdateSampleTime, ResearchTransmitInterval, TemperatureSampleTime, and SelfTestSampleTime. The bottom of the interface shows a status bar with 'Tag write OK'.

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 C63.10-2013.

### 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 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.

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### 3 Radiated emission data.

**RESULT: Pass**

Date of testing: 2019-07-12 & 16

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).

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a)/ RSS-Gen (8.9) or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

**Test procedure:**

ANSI C63.10-2013.

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. For final testing the EUT was tested only in vertical position, it's only (normal) use position.

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

Frequency (MHz)	Detector	Polarization	Results (dB $\mu$ V/m)	Limits @3m (dB $\mu$ V/m)	Pass/Fail
566.9	Qp	Vertical	21.9	46	Pass
729.2	Qp	Vertical	24.9	46	Pass
787.9	Qp	Vertical	25.0	46	Pass
Fundamentals:					
433.60	Pk	Vertical	89.4	92.86	Pass
433.80	Pk	Vertical	85.7	92.86	Pass
434.00	Pk	Vertical	83.8	92.87	Pass
434.20	Pk	Vertical	88.9	92.88	Pass
867.20 *H	Qp	Horizontal	26.1	52.9	Pass
867.60 *H	Qp	Vertical	35.7	52.9	Pass
868.00 *H	Qp	Vertical	35.8	52.9	Pass
868.40 *H	Qp	Vertical	36.1	52.9	Pass
1439.7 *R	Pk	Vertical	38.0	74 Pk / 54 Av	Pass
1440.2 *R	Pk	Vertical	45.2	74 Pk / 54 Av	Pass
1440.7 *R	Pk	Vertical	44.2	74 Pk / 54 Av	Pass
1440.2 *R	Pk	Vertical	44.0	74 Pk / 54 Av	Pass
1.734 *H	Pk	Vertical	53.0	74 Pk / 54 Av	Pass
1.735 *H	Pk	Vertical	54.0 Pk 48.4 Av	74 Pk / 54 Av	Pass
1.736 *H	Pk	Vertical	53.2 Pk 47.5 Av	74 Pk / 54 Av	Pass
1.737 *H	Pk	Vertical	50.2	74 Pk / 54 Av	Pass
2.15	Pk	Vertical	45.9	74 Pk / 54 Av	Pass
2.60	Pk	Vertical	46.5	74 Pk / 54 Av	Pass

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 (8.9, 8.10) are depicted in Table 1.

**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. Measurements were performed up to the 10th harmonic of the transmit frequency of 434.2 MHz.
3. A resolution bandwidth of 120 kHz was used below 1000 MHz.
4. Above 1000 MHz a Peak detector was used with a bandwidth of 1 MHz.
5. \* H denotes a harmonic of the fundamental, \*R denotes an emission in a restricted band
6. A selection of plots are provided on the next pages.

Used test equipment and ancillaries:

A00447	A00444	A00235	A00466	A00008	A00450	A00257	A00337	A00258
A00466								

### 3.2 Radiated field strength measurements of the fundamental, Average values

The Table below show calculated average values from the pulsed emissions measurement data, corrected with the worst case duty cycle factor over 100 msec. The average values noted are calculated through the application of a duty cycle correction, according to part 15.35c

Duty cycle calculation:

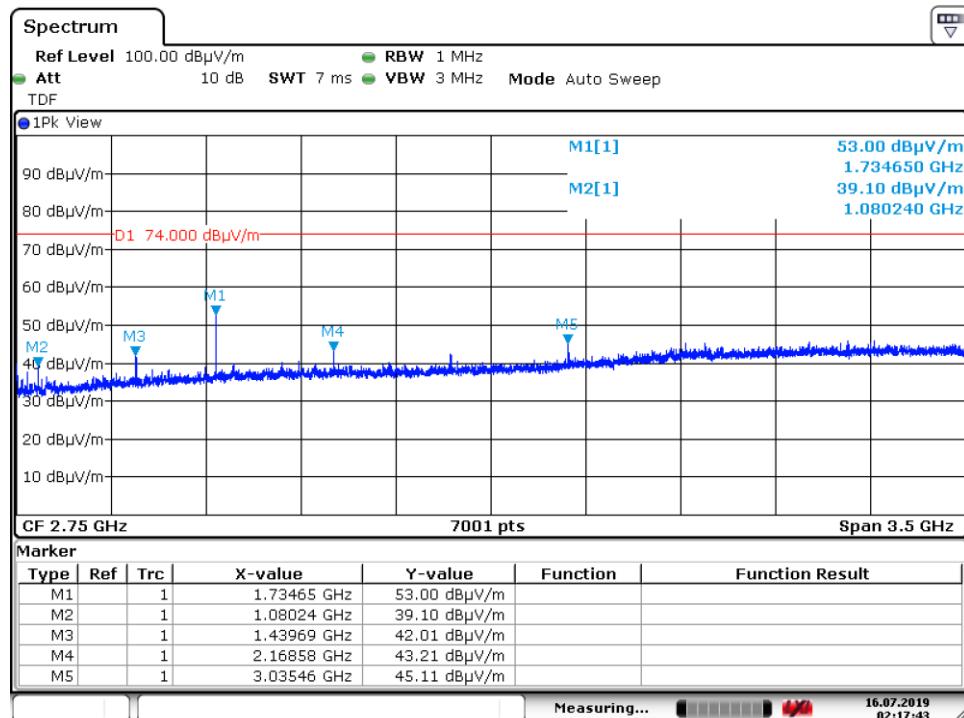
$$\text{Duty cycle correction (dB)} = 20 \log (9.6 \text{ msec} / 100 \text{ msec}) = -20.35 \text{ dB}$$

Frequency (MHz)	Measurement results Pk @3m (dB $\mu$ V)	Duty Cycle correction (dB)	Calculated results Pk @3m (dB $\mu$ V)	Limits @3m (dB $\mu$ V/m)	Pass/ Fail
Fundamentals:					
433.60	89.4	-20.35	69.05	72.86	Pass
433.80	85.7	-20.35	65.35	72.86	Pass
434.00	83.8	-20.35	63.45	72.87	Pass
434.20	88.9	-20.34	68.55	72.88	Pass

Table 2 Radiated emissions of the EUT, Average values.

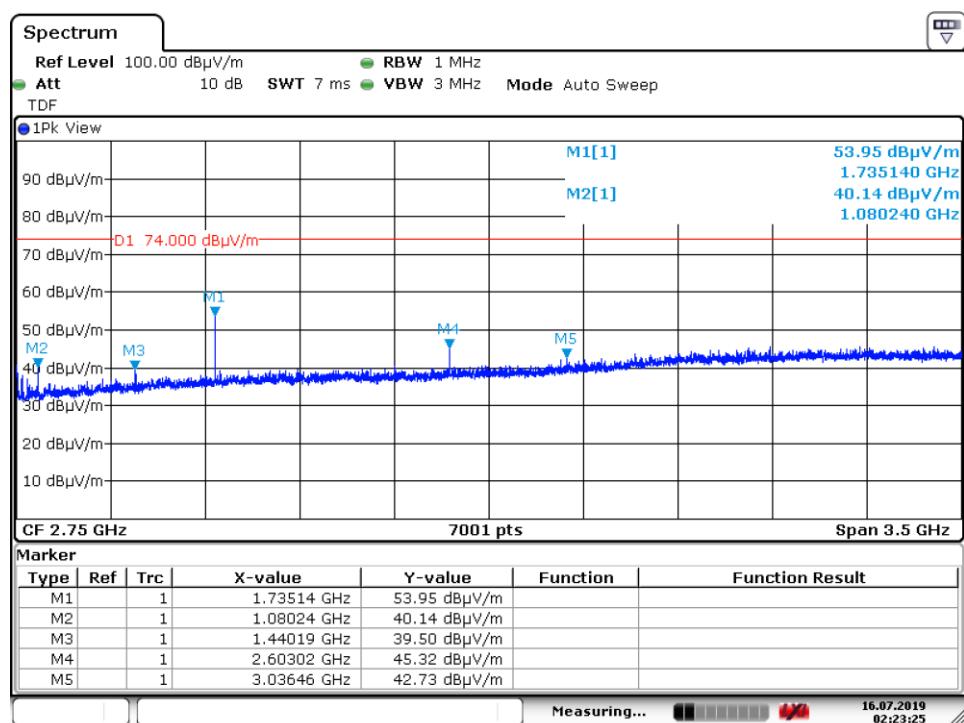
The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.35, 15.205, 15.209, 15.231(e), RSS-210 and RSS-Gen are depicted in Table 2.

### 3.3 Plots of the emissions



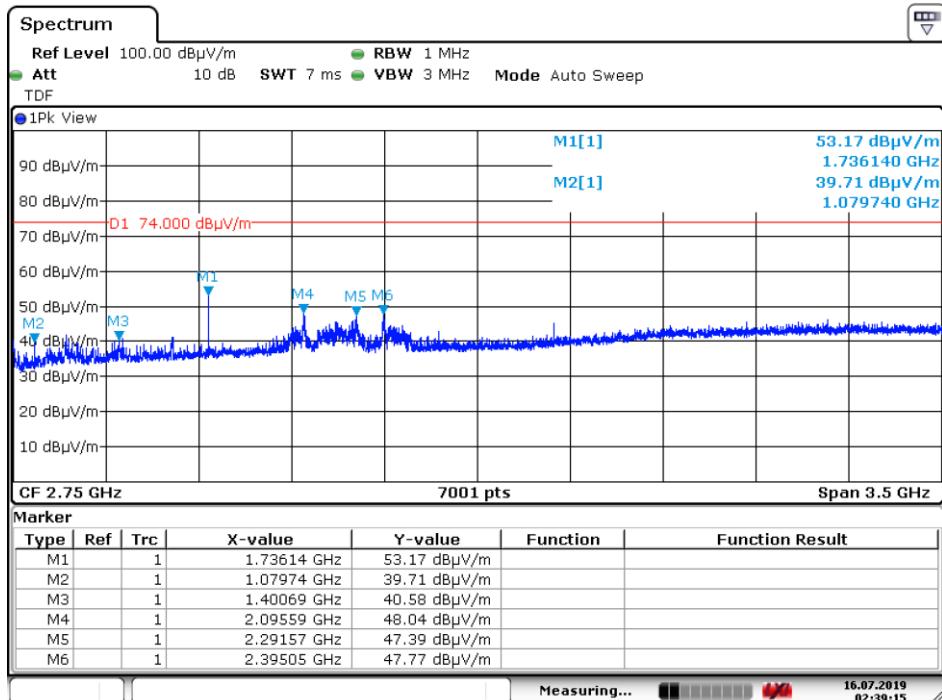
Date: 16.JUL.2019 02:17:43

Plot of the emissions in the range 1G – 4.5 GHz, Antenna Horizontal, EUT @ 433.6 MHz



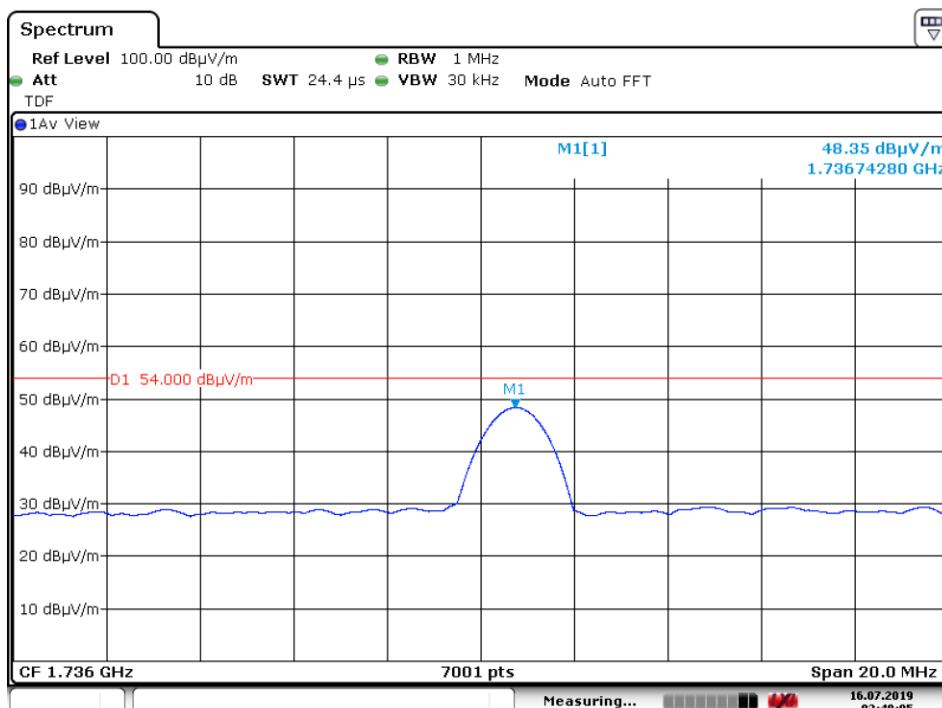
Date: 16.JUL.2019 02:23:25

Plot of the emissions in the range 1G – 4.5 GHz, Antenna Vertical, EUT @ 433.8 MHz



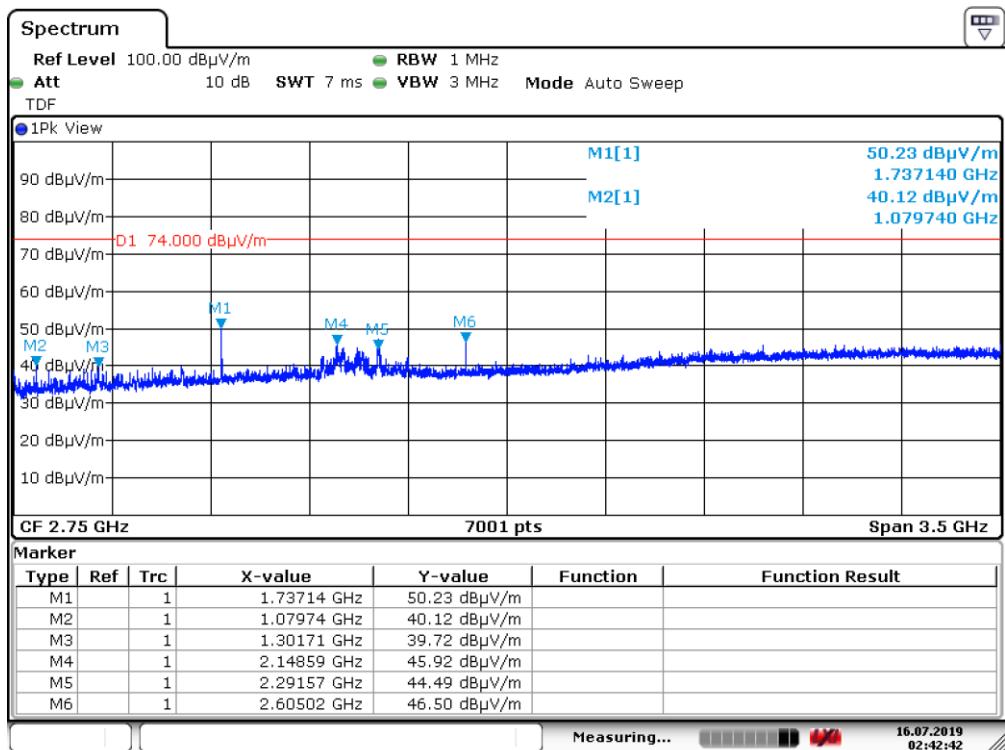
Date: 16.JUL.2019 02:39:15

Plot of the emissions in the range 1G – 4.5 GHz, Antenna Vertical, EUT @ 434.0 MHz



Date: 16.JUL.2019 02:48:05

Plot of the emissions at 1.737 GHz, Average value, Antenna Vertical, EUT @ 434.0 MHz



Date: 16.JUL.2019 02:42:42

Plot of the emissions in the range 1G – 4.5 GHz, Antenna Vertical, EUT @ 434.2 MHz

## 4 AC Power line Conducted emission data.

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

**RESULT: Not applicable, the EUT is battery operated only.**

Date of testing: Not applicable

## 5 Plots of measurement data

### 5.1 Bandwidth of the emission

**RESULT: PASS**

Date of testing: 2019-07-26

Requirement:

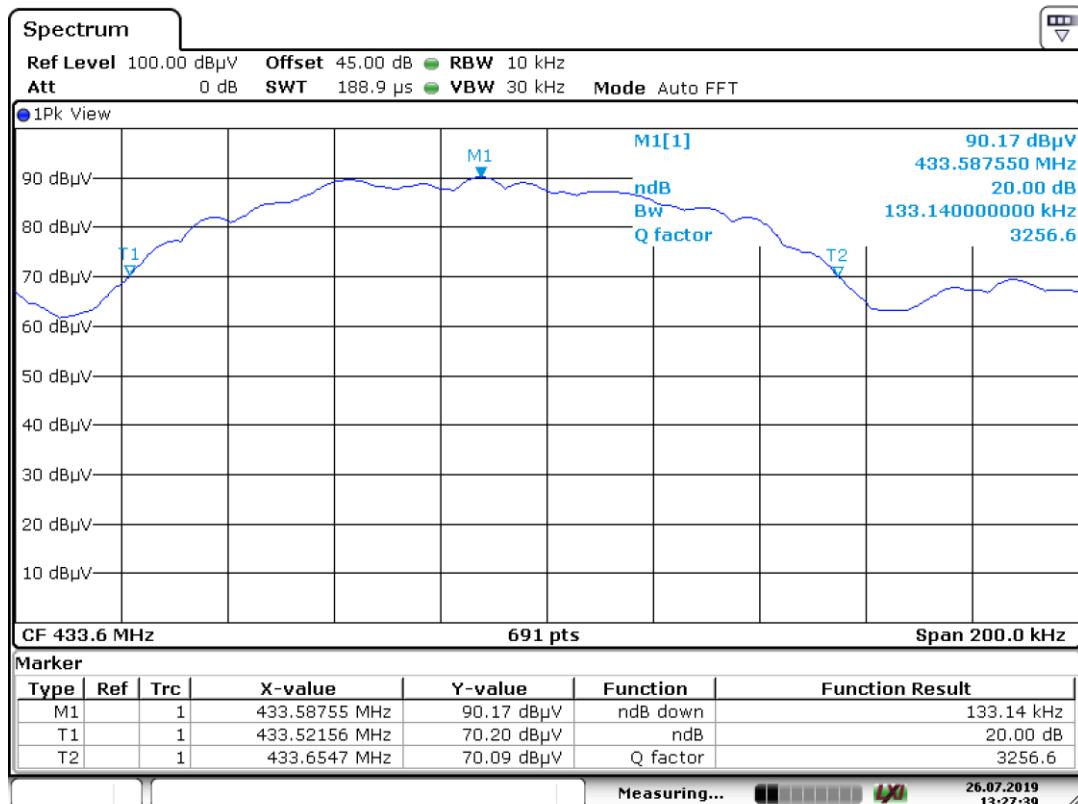
The bandwidth of emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

For this EUT operating at the lowest operating frequency of 433.60 MHz (Channel 1) the allowable bandwidth of emissions would be:

$$0.25\% * 433.60 \text{ MHz} = 1084.0 \text{ kHz}$$

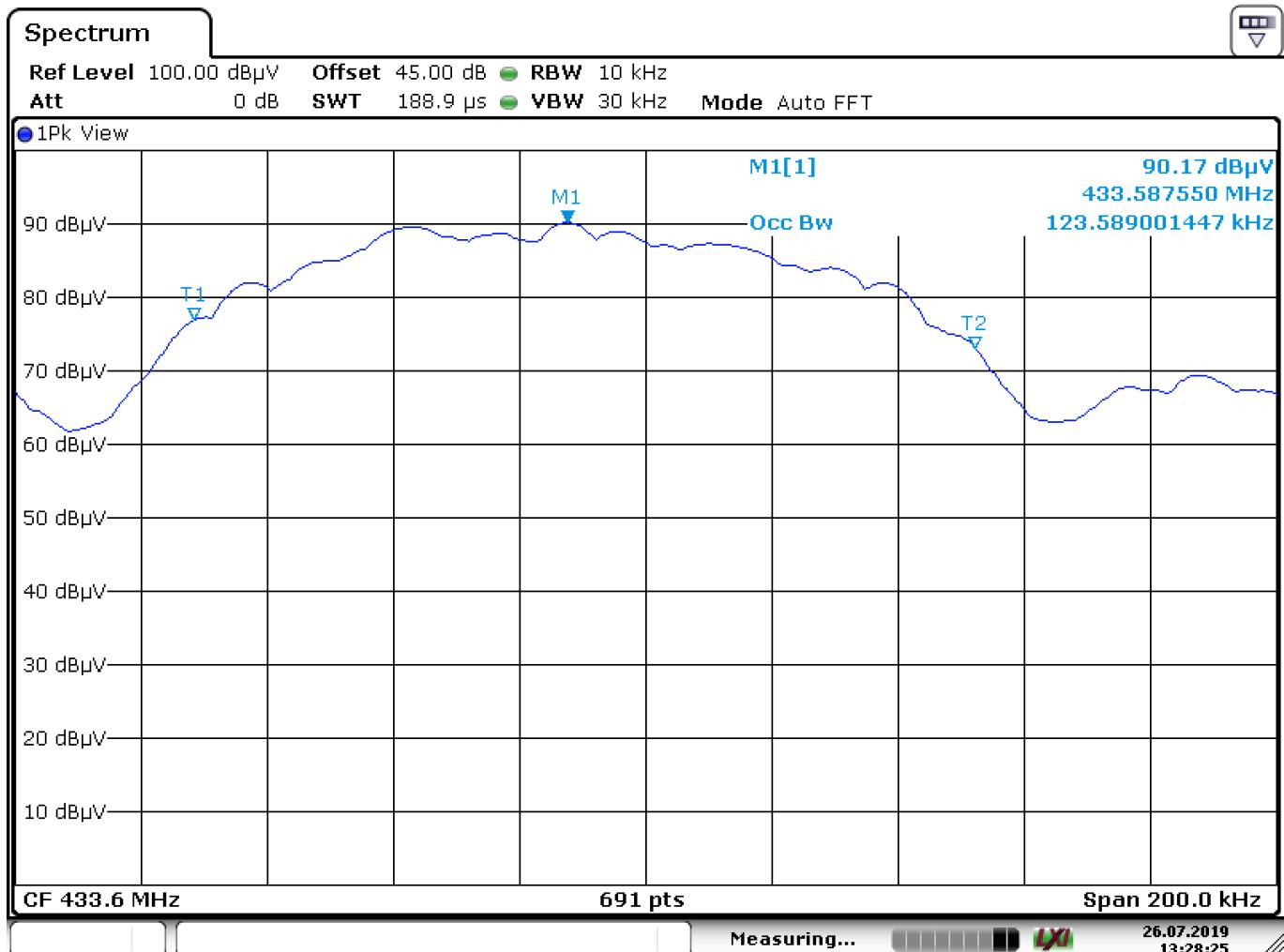
Testresult:

The measured bandwidth of the emissions as measured with a spectrum analyzer was: **133.14 kHz** (see Plot 1a).



Date: 26.JUL.2019 13:27:40

Plot1a: plot of the emission at Channel 1. Measured value is 133.14 kHz as measured on a spectrum analyzer.



Date: 26.JUL.2019 13:28:25

Plot 1b: plot of the 99% emission bandwidth Channel 1. Measured value is 123.59 kHz as measured on a spectrum analyzer.

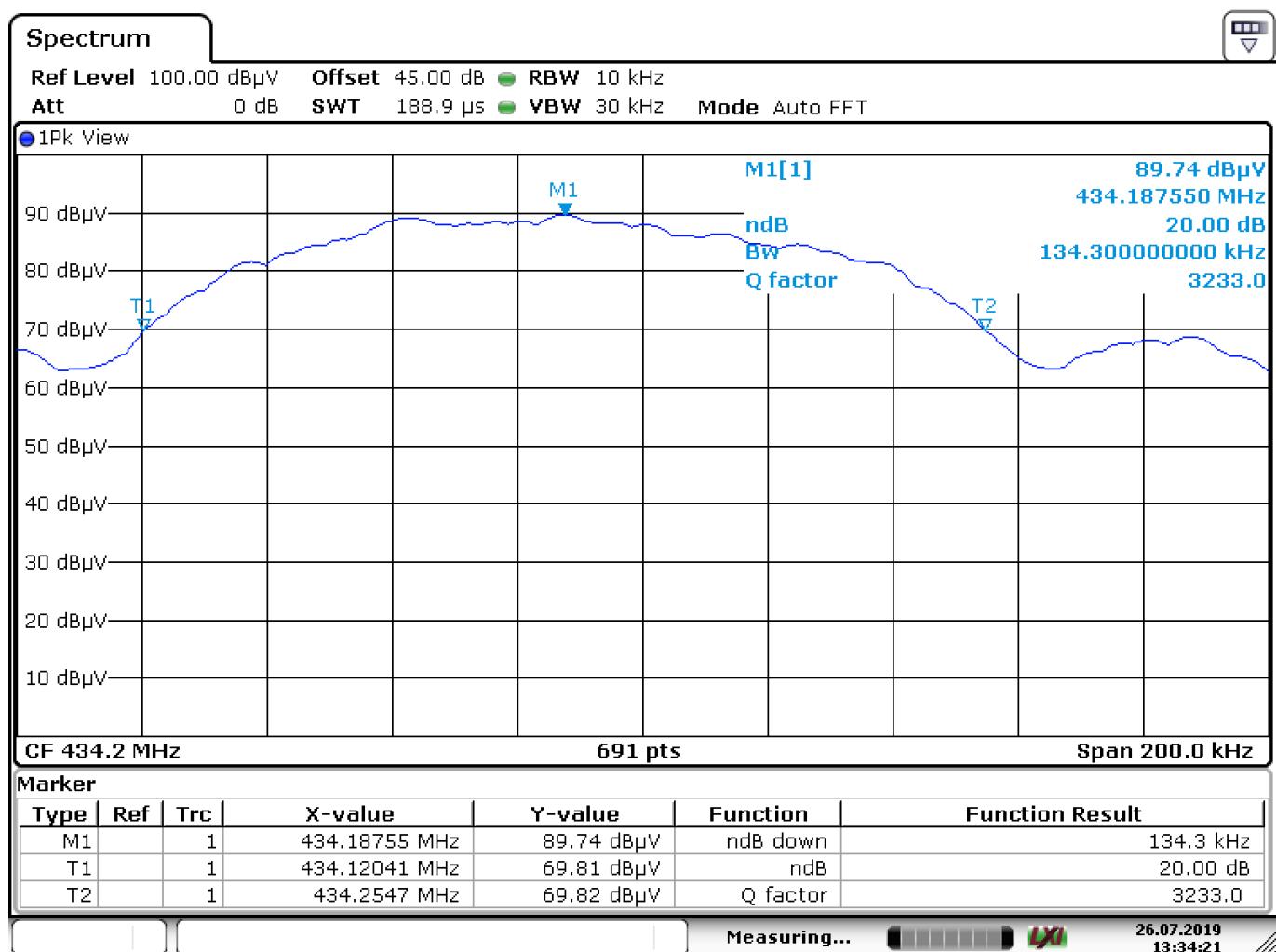
## Requirement:

For this EUT operating at the highest operating frequency of 434.20 MHz (Channel 4) the allowable bandwidth of emissions would be:

$$0.25\% * 434.20 \text{ MHz} = 1085.5 \text{ kHz.}$$

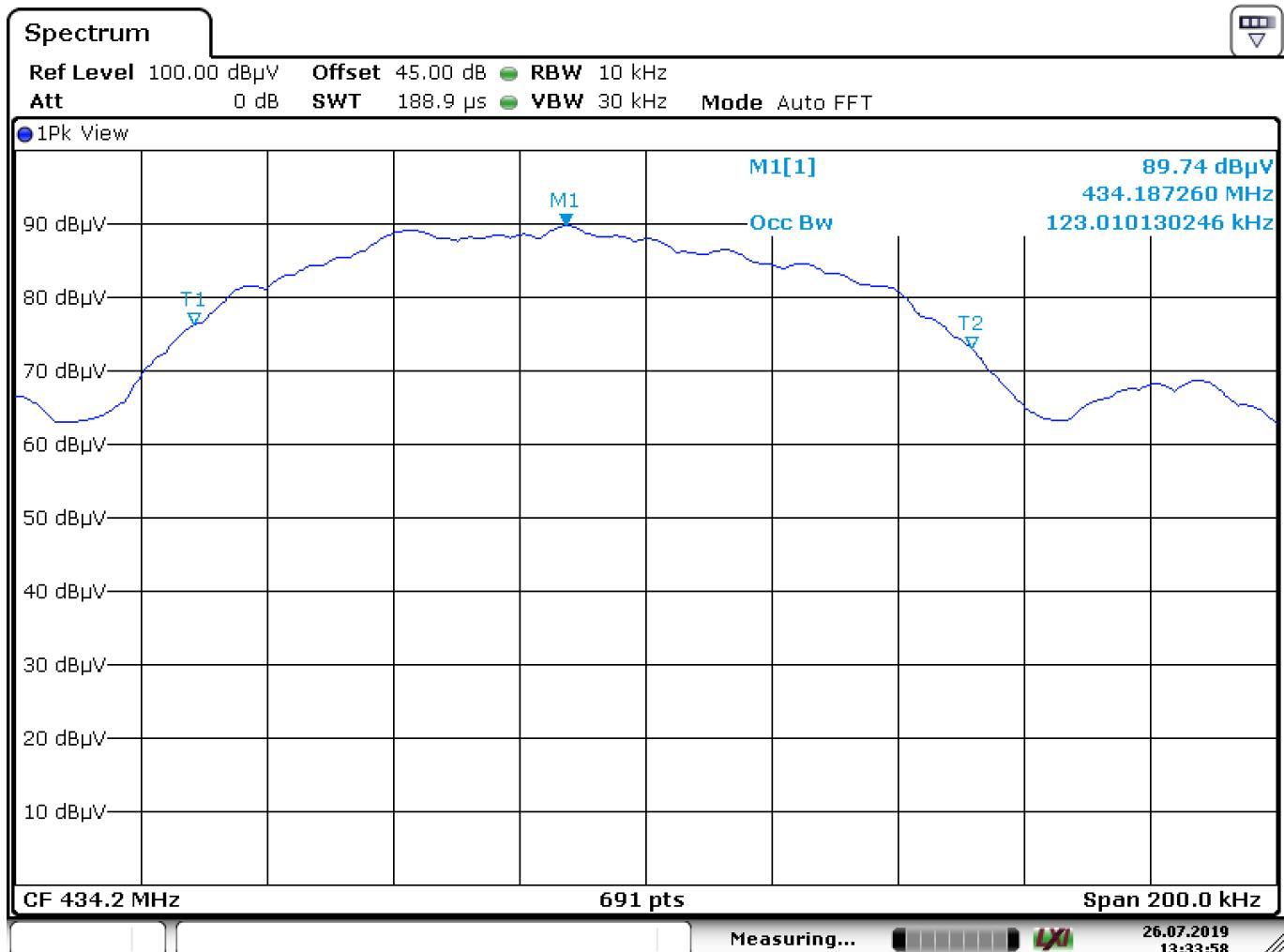
## Testresult:

The measured bandwidth of the emissions as measured with a spectrum analyzer was: **134.30 kHz** (see Plot2a).



Date: 26.JUL.2019 13:34:21

Plot2a: plot of the emission at Channel 4. Measured value is 134.30 kHz as measured on a spectrum analyzer.



Date: 26.JUL.2019 13:33:59

Plot 2b: plot of the 99% emission bandwidth Channel 4. Measured value is 123.01 kHz as measured on a spectrum analyzer.

## 5.2 RF On time

### RESULT: PASS

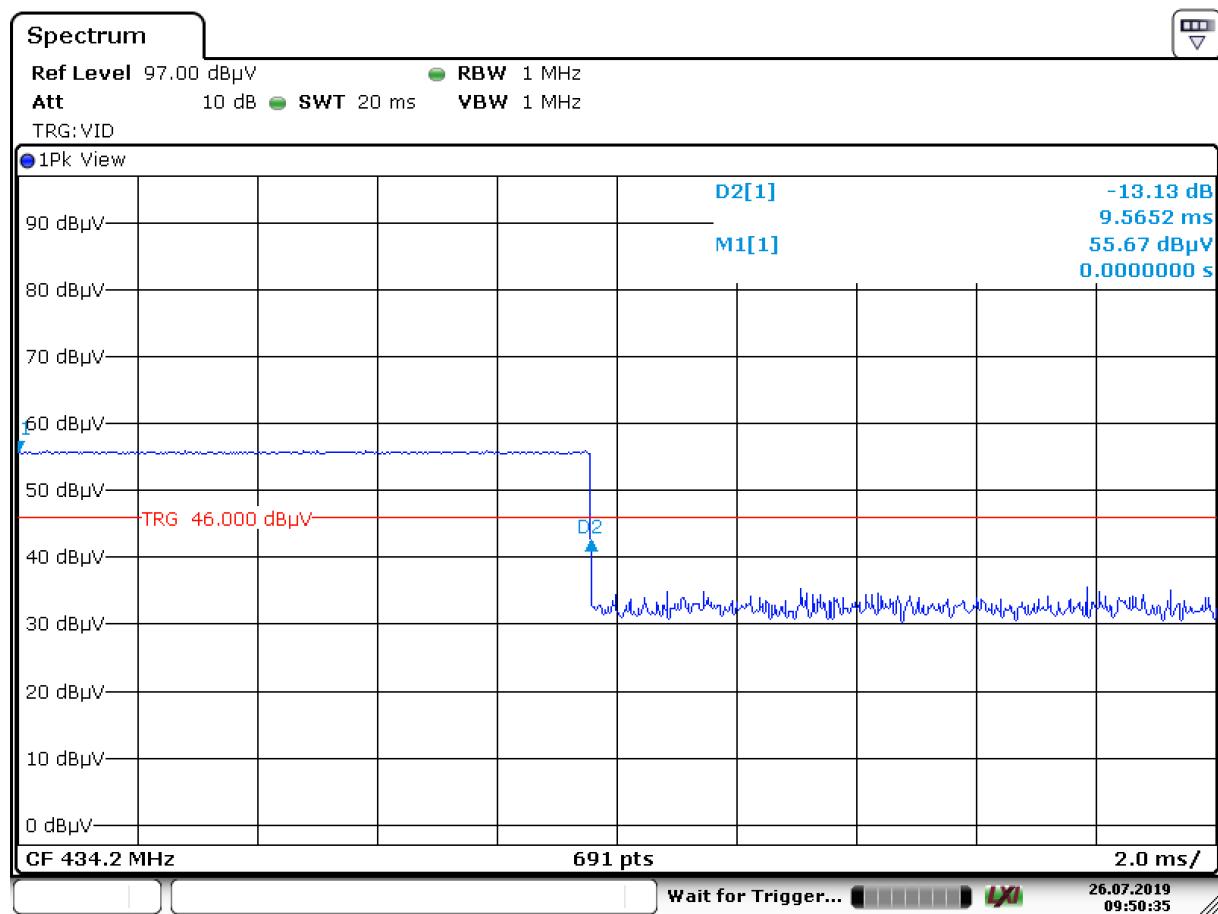
Date of testing: 2019-07-26

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)

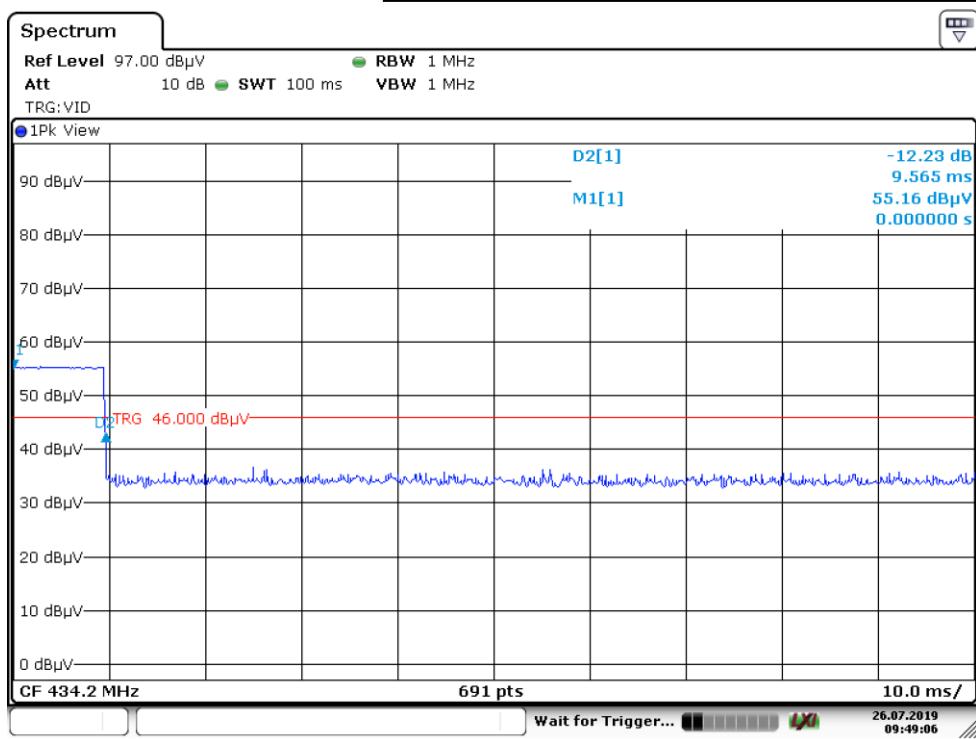
Test result:

Plot 3 and plot 4 below shows the EUT's RF On Time. The RF On time in 100 ms is: 9.6 ms.



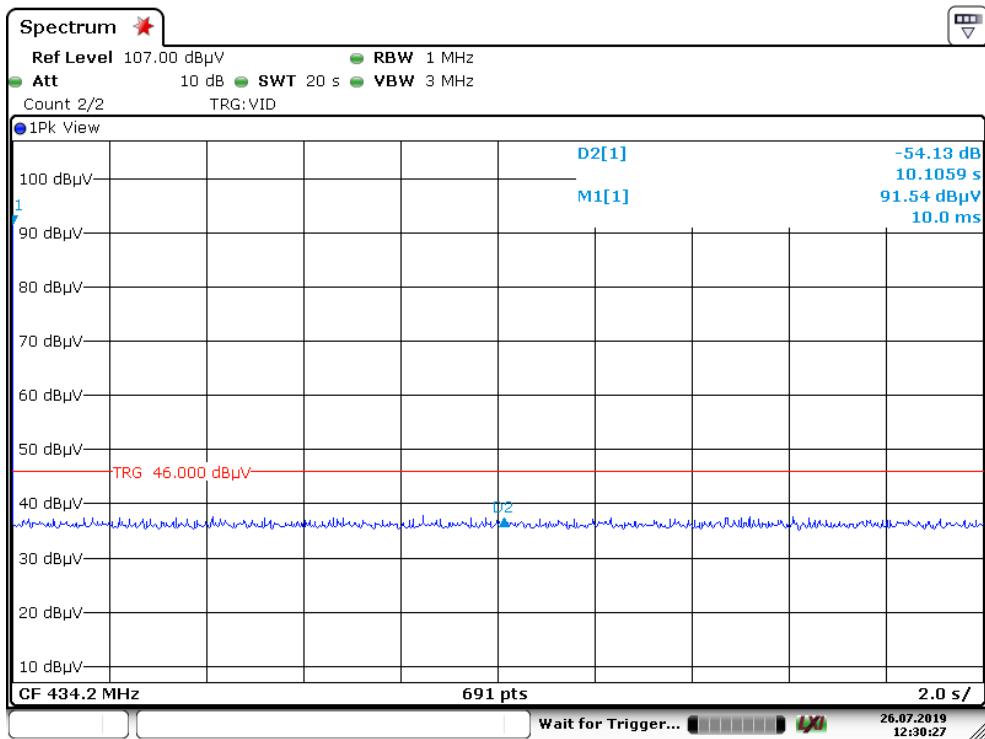
Date: 26.JUL.2019 09:50:35

Plot 3: RF On Time of the transmitter is less than 1 sec. as measured on a spectrum analyzer.



Date: 26.JUL.2019 09:49:06

Plot 4: RF On Time in a 100ms period, as measured on a spectrum analyzer.



Date: 26.JUL.2019 12:30:28

Plot 5: 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 5 above where the RF On is indicated with marker 1. Marker D2 indicates the 10 seconds period, while the whole plot covers 20 seconds.

**<< End of report >>**