# TEST REPORT CONCERNING THE COMPLIANCE OF A WIRELESS SPACE COUNT, BRAND NEDAP, MODEL SENSIT SURFACE MOUNT WITH 47 CFR PART 15 (10-1-12 Edition), RSS-Gen (issue 3, December 2010) and RSS-210 (Issue 8, December 2010).

**13013101.fcc01_Rev01**
**November 06, 2013**

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

**TÜV Rheinland EPS**
Eiberkamp 10
9351 VT Leek
Telephone: +31 88 8887888
Telefax: +31 594 504804

E-mail: info@tuv-eps.com
Web: www.tuv.com

# MEASUREMENT/TECHNICAL REPORT

## N.V. Nederlandsche Apparatenfabriek "Nedap"
## Model: SENSIT SURFACE MOUNT

## FCC ID: CGDSENSITSM
## IC: 1444A-SENSITSM

| | |
|---|---|
| This report concerns: Original grant/certification ~~Class 1 permissive change~~ ~~Verification~~<br>Equipment type: Spread Spectrum Transmitter (DSS) | |
| | |
| Report prepared by: | Name : Richard van der Meer<br>Company name : TÜV Rheinland EPS<br>Address : Eiberkamp 10<br>Postal code/city : 9351VT Leek<br>Mailing address : P.O. Box 37<br>Postal code/city : 9350 AA Leek<br>Country : The Netherlands<br>Telephone number : + 31 594 505 005<br>Telefax number : + 31 594 504 804<br>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) and the measurement procedures of ANSI C63.10-2009 and FCC Public Notice DA 00-705. 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: November 06, 2013

Signature:

O. Hoekstra
Senior Engineer Telecom TÜV Rheinland EPS

## Description of test item

| | | |
|---|---|---|
| Test item | : | Wireless Space Count Node |
| Manufacturer | : | N.V. Nederlandsche Apparatenfabriek "Nedap" |
| Brand | : | Nedap |
| Model(s) | : | SENSIT SURFACE MOUNT |
| Serial number(s) | : | -- |
| ID | : | 0200 |

## Applicant information

| | | |
|---|---|---|
| Applicant's representative | : | Mr. J. Hulshof |
| Company | : | N.V. Nederlandsche Apparatenfabriek "Nedap" |
| Address | : | Parallelweg 2 |
| 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 | : | April 09, 2013 |
| Test(s) completed | : | April 11, 2013 |
| Purpose of test(s) | : | Equipment Authorization (Original grant/certification) |
| Test specification(s) | : | FCC 47 CFR Part 15, Subpart C, Section 15.247 (10-1-12 Edition)<br>RSS-Gen (Issue 3, December 2010) an RSS-210 (Issue 8, December 2010)<br>ANSI C63.10: 2009, Public Notice DA 00-705 march 30, 2000 |

| | | |
|---|---|---|
| Test engineer(s) | : | R. van der Meer |
| Report written by | : | R. van der Meer |
| Report date | : | November 06, 2013 |

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# 1 General information.

## 1.1 Product description.

### 1.1.1 Introduction.

The brand Nedap model SENSIT SURFACE MOUNT, hereafter referred to as EUT, is a Spread Spectrum Transmitter (DSS). The SENSIT vehicle detection system facilitates accurate measurement on occupancy of individual parking spaces in car parks, and on-street parking spaces. This information can be used to guide traffic to free parking spaces but can also be used for on-street parking enforcement and overstay detection. The EUT is factory configured for the 902-928 MHz band. The device is battery operated only.

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).

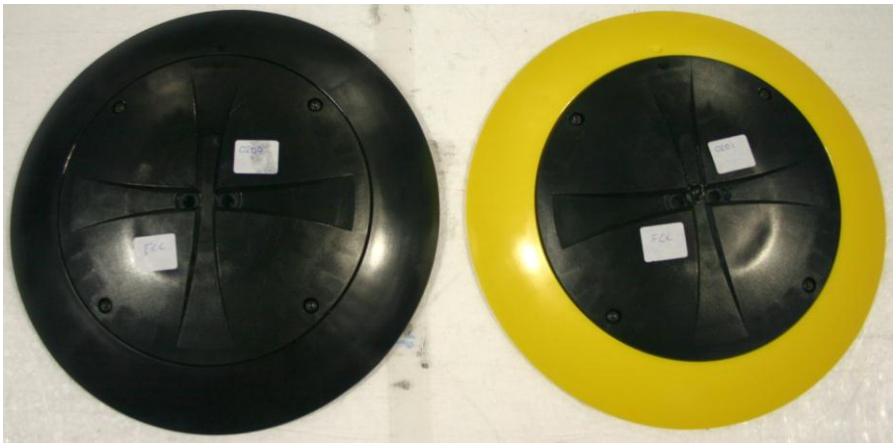
### 1.2.1 General.

This test report supports the original certification in equipment authorization files under **FCC ID: CGDSENSITSM and IC: 1444A-SENSITSM**.

## 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 | : | Node of the Wireless Space Count System |
| Manufacturer | : | N.V. Nederlandsche Apparatenfabriek "Nedap" |
| Brand | : | Nedap |
| Model | : | SENSIT SURFACE MOUNT |
| Serial number | : | n.a. |
| Voltage input rating | : | n.a. |
| Voltage output rating | : | n.a. |
| Current input rating | : | not provided |
| Antenna | : | internal |
| Operation frequency | : | 902 – 928 MHz |
| Modulation | : | GFSK |
| Spreading technique | : | FHSS |
| Clock frequency | : | 16.000 MHz |
| Remarks | : | senses cars on parking place and transmits data to AUX1, battery operated |



Photograph of the EUT, two versions available- the difference is purely cosmetic, with only the outer ring being black or yellow.

| | | |
|---|---|---|
| AUX1 | : | SENSIT DATACOLLECTOR |
| Manufacturer | : | N.V. Nederlandsche Apparatenfabriek “Nedap” |
| Brand | : | Nedap |
| Model | : | SENSIT DATACOLLECTOR |
| Serial number | : | n.a. |
| Voltage input rating | : | 5Vdc |
| Voltage output rating | : | n.a. |
| Current input rating | : | 1A |
| Antenna | : | External |
| Remarks | : | collects data wireless |
| FCC ID | : | CGDSENSDATA |
| IC | : | 1444A-SENSDATA |

| | | |
|---|---|---|
| AUX2 | : | Mains Power Supply Adapter |
| Brand | : | Power-Win Technology Corp. |
| Model | : | PW-015A-1Y050K1 |
| Serial number | : | -- |
| Voltage input rating | : | 100-240V-1A, 50-60Hz |
| Voltage output rating | : | 5Vdc 3A, 15W max. |
| Remark | : | power supply for AUX1 |

| | | |
|---|---|---|
| AUX3 | : | Laptop Computer |
| Brand | : | HP |
| Model | : | Compaq nc6400 |
| Serial number | : | -- |
| Remark | : | Supplied by the applicant |

| | | |
|---|---|---|
| AUX4 | : | Mains Power Supply Adapter |
| Brand | : | HP |
| Model | : | Series PPP009L |
| Serial number | : | 7301591201 |
| Remark | : | Rev:A02, power supply for AUX3 |

| | | |
|---|---|---|
| AUX5 | : | SENSIT Node |
| Manufacturer | : | N.V. Nederlandsche Apparatenfabriek “Nedap” |
| Brand | : | Nedap |
| Model | : | SENSIT Node IR |
| FCC ID | : | CGDSENSNODE |
| IC | : | 1444A-SENSNODE |
| Remark | : | -- |

### 1.3.1 Description of input and output ports.

| Number | Terminal | From | To | Remarks |
|---|---|---|---|---|
| 1 | Mains | AUX2 | AUX1 | -- |
| 2 | Mains | AUX4 | AUX3 | -- |
| 3 | RS 232 port | AUX1 | AUX3 | shielded cable RS232 to USB |

Table 1: Interconnection between EUT and auxiliary equipment

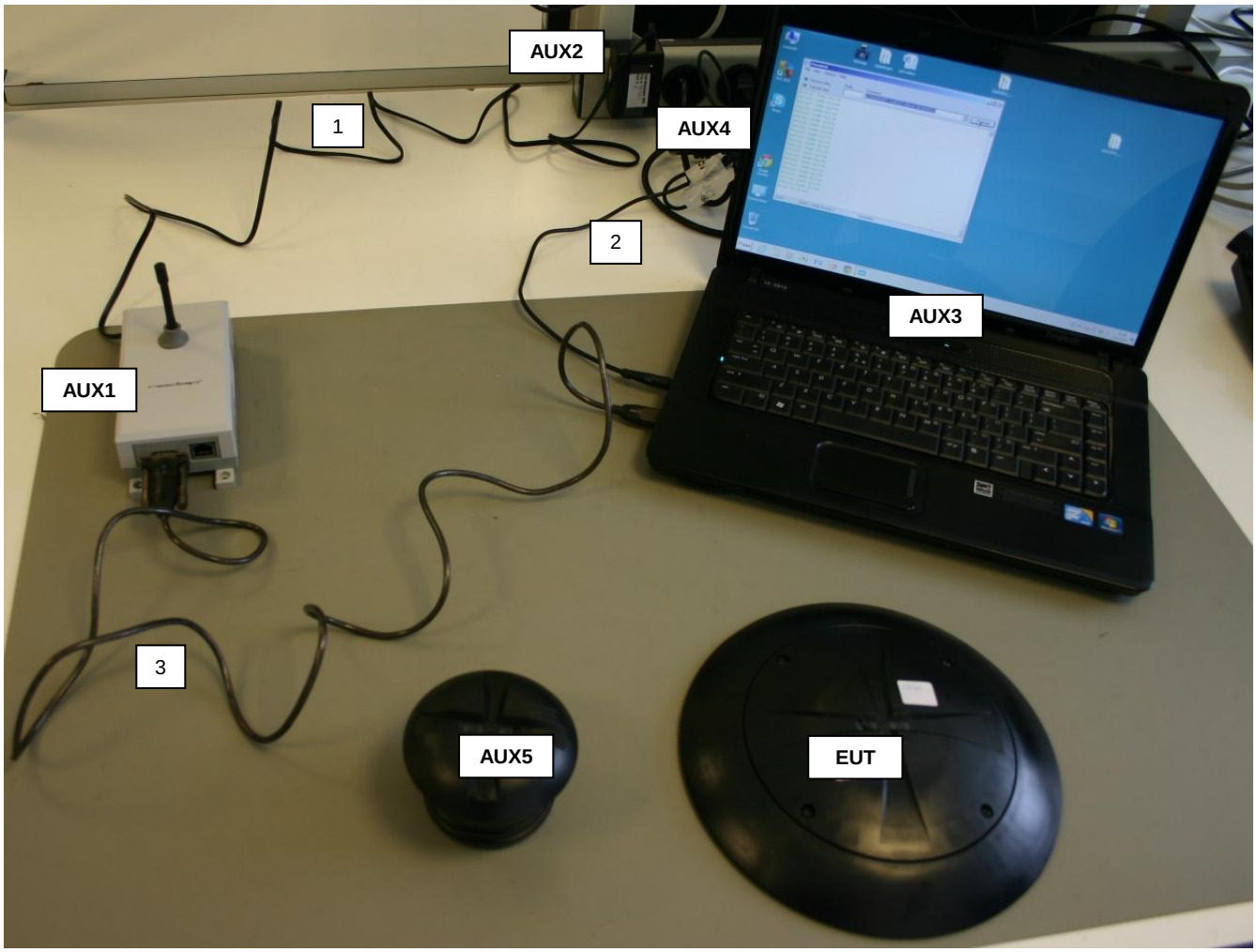



Photo 1: Basic test setup and connections

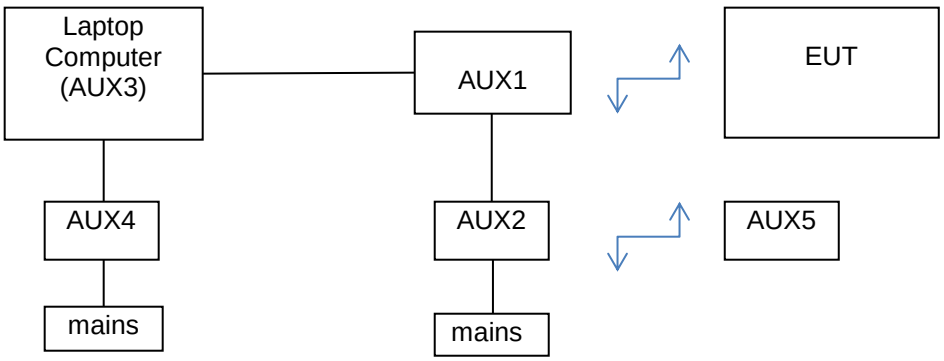



Figure 1. Blockdiagram of the basic test setup and connections

### 1.4 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (10-1-12 Edition), sections 15.31, 15.209 and 15.247 and RSS-Gen (issue 3, December 2010) an RSS-210 (Issue 8, December 2010).

The test methods, which have been used, are based on ANSI C63.4: 2003 and FCC Public Notice DA 00-705.

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

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.

### 1.5 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.

### 1.6 Test conditions.

Normal test conditions:

| | |
|---|---|
| Temperature (*) | : +15°C to +35°C |
| Relative humidity(*) | : 20 % to 75 % |
| Supply voltage | : EUT and AUX5 are battery powered and new batteries were used for testing,AUX: 115VAC/60Hz |
| 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 fashion (as a customer would normally use it). Software was provided by the applicant to enable continues transmit mode or normal mode.

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: 2009.

## 2.2 EUT mode of operation.

The EUT has been tested in continuous transmit mode and in receive mode. Testing was performed at the lowest operating frequency (902.4), at the operating frequency in the middle of the specified frequency band (915.0MHz) and at the highest operating frequency (927.6 MHz).

## 2.3 Special accessories.

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

## 2.4 Test software.

The EUT was provided by the manufacturer with suitable software to allow operation in all the required modes. Software used for testing: Nedap AVI Terminal.

This software was running on a laptop computer (AUX3). It was used to enable the test operation modes listed in section 2.2 as appropriate.

## 2.5 Equipment modifications.

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

## 2.6 Product Labeling

The product labeling information is available at N.V. Nederlandsche Apparatenfabriek "Nedap".

## 2.7 Schematics of the EUT.

The schematics are available at N.V. Nederlandsche Apparatenfabriek "Nedap".

## 2.8 Part list of the EUT.

The part list is available at N.V. Nederlandsche Apparatenfabriek "Nedap".

# 3 Radiated Spurious Emissions of the Transmitter.

**RESULT: PASS**

Date of testing: 2013-04-10 and 11

Requirements:

FCC 15.247(d) and RSS-210 Section A8.5.

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 Table 5 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).
Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-Gen Table 3, must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen Table 5.

Test procedure:

ANSI C63.10: 2009 and Public Notice DA 00-705 March 30, 2000 Alternative test procedures.

The EUT was tested against the limit specified in FCC 15.209(a)/ RSS Gen Table 5.

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 (10GHz). 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. The final measurement takes into account the loss generated by all the involved cables and filters.

The Dwell Time of the EUT, see plot 8 page 26, is less than 100 ms and the measured value with Average detector may be adjusted with a ‘’duty cycle correction factor”, derived from 20 log (dwell time/100ms). In this case:
Duty Cycle Correction factor = 20 log (4.03ms/100ms) = -28 dB.

| Freq. [MHz] | Antenna Orientation | Detector | Level [dBµV/m] | Duty Cycle correction factor [dB] | Level after correction [dBµV/m] | Limit [dBµV/m] |
|---|---|---|---|---|---|---|
| 57.840 | Horizontal | Qp | 29.2 | 0 | 29.2 | 40.0 |
| 557.22 | Vertical | Qp | 41.1 | 0 | 41.1 | 46.0 |
| 886.08 | Vertical | Qp | 38.1 | 0 | 38.1 | 46.0 |
| 1804.8*[h] | Vertical | Pk | 70.0 | 0 | 70.0 | 74.0 |
| 1804.8*[h] | Vertical | Av | 70.0 | -28 | 42.0 | 54.0 |
| 2702.2*[h] | Vertical | Pk | 62.3 | 0 | 62.3 | 74.0 |
| 2702.2*[h] | Vertical | Av | 62.3 | -28 | 34.3 | 54.0 |
| 3609.6*[h] | Vertical | Pk | 70.8 | 0 | 70.8 | 74.0 |
| 3609.6*[h] | Vertical | Av | 70.8 | -28 | 42.8 | 54.0 |

Table 1a Radiated spurious emissions of the EUT at 902.4 MHz

| Freq. [MHz] | Antenna Orientation | Detector | Level [dBµV/m] | Duty Cycle correction factor [dB] | Level after correction [dBµV/m] | Limit [dBµV/m] |
|---|---|---|---|---|---|---|
| 117.00 | Horizontal | Qp | 35.6 | 0 | 35.6 | 40.0 |
| 619.86 | Vertical | Qp | 34.4 | 0 | 34.4 | 46.0 |
| 887.82 | Vertical | Qp | 40.8 | 0 | 40.8 | 46.0 |
| 1830.0*[h] | Vertical | Pk | 67.8 | 0 | 67.8 | 74.0 |
| 1830.0*[h] | Vertical | Av | 67.8 | -28 | 39.8 | 54.0 |
| 2745.0*[h] | Vertical | Pk | 56.5 | 0 | 56.5 | 74.0 |
| 2745.0*[h] | Vertical | Av | 56.5 | -28 | 28.5 | 54.0 |
| 3660.0*[h] | Vertical | Pk | 73.6 | 0 | 73.6 | 74.0 |
| 3660.0*[h] | Vertical | Av | 73.6 | -28 | 45.6 | 54.0 |
| 2717.0 | Vertical | Pk | 68.7 | 0 | 68.7 | 74.0 |
| 2717.0 | Vertical | Av | 68.7 | -28 | 40.7 | 54.0 |
| 3203.3 | Vertical | Pk | 49.2 | 0 | 49.2 | 54.0 |

Table 1b Radiated spurious emissions of the EUT at 915.0 MHz

| Freq. [MHz] | Antenna Orientation | Detector | Level [dBµV/m] | Duty Cycle correction factor [dB] | Level after correction [dBµV/m] | Limit [dBµV/m] |
|---|---|---|---|---|---|---|
| 249.13 | Horizontal | Qp | 30.4 | 0 | 30.4 | 43.5 |
| 491.62 | Vertical | Qp | 36.8 | 0 | 36.8 | 46.0 |
| 773.62 | Vertical | Qp | 41.1 | 0 | 41.1 | 46.0 |
| 1855.2*[h] | Vertical | Pk | 65.6 | 0 | 65.6 | 74.0 |
| 1855.2*[h] | Vertical | Av | 65.6 | -28 | 37.6 | 54.0 |
| 2782.8*[h] | Vertical | Pk | 55.9 | 0 | 55.9 | 74.0 |
| 2782.8*[h] | Vertical | Av | 55.9 | -28 | 27.9 | 54.0 |
| 3610.4*[h] | Vertical | Pk | 70.2 | 0 | 70.2 | 74.0 |
| 3610.4*[h] | Vertical | Av | 70.2 | -28 | 42.2 | 54.0 |
| 1831.4 | Vertical | Pk | 59.6 | 0 | 59.6 | 74.0 |
| 1831.4 | Vertical | Av | 59.6 | -28 | 31.6 | 54.0 |
| 2712.7 | Vertical | Pk | 58.7 | 0 | 58.7 | 74.0 |
| 2712.7 | Vertical | Av | 58.7 | -28 | 30.7 | 54.0 |
| 5568.2 | Vertical | Pk | 50.6 | 0 | 50.6 | 54.0 |

Table 1c Radiated spurious emissions of the EUT at 927.6 MHz

| Freq. [MHz] | Antenna Orientation | Detector | Level [dBµV/m] | Duty Cycle correction factor [dB] | Level after correction [dBµV/m] | Limit [dBµV/m] |
|---|---|---|---|---|---|---|
| 452.82 | Horizontal | Qp | 33.3 | 0 | 33.3 | 46.0 |
| 677.68 | Vertical | Qp | 36.9 | 0 | 36.9 | 46.0 |
| 779.94 | Vertical | Qp | 38.0 | 0 | 38.0 | 46.0 |
| 1856.7*[h] | Vertical | Pk | 69.5 | 0 | 69.5 | 74.0 |
| 1856.7*[h] | Vertical | Av | 69.5 | -28 | 41.5 | 54.0 |
| 2764.1*[h] | Vertical | Pk | 63.6 | 0 | 63.6 | 74.0 |
| 2764.1*[h] | Vertical | Av | 63.6 | -28 | 35.6 | 54.0 |
| 3659.2*[h] | Vertical | Pk | 73.3 | 0 | 73.3 | 74.0 |
| 3659.2*[h] | Vertical | Av | 73.3 | -28 | 45.3 | 54.0 |

Table 1d Radiated spurious emissions of the EUT in normal mode (hopping)

The results of the radiated emission tests in the range 30 MHz – 10 GHz, carried out in accordance with 47 CFR Part 15 section 15.209 with the system operating in transmit mode are depicted in Table 1a through 1d. See note on the next page.

**Notes:**

1. Field strength values of radiated emissions at frequencies in the range 30 MHz – 10 GHz not listed in the table above are more than 20 dB below the applicable limit.
2. Measurement uncertainty is ±5.0dB
3. The reported field strength values are the worst case values at the indicated frequency. The receiving antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
4. $*^{h}$ = harmonic of the fundamental frequency.
5. Where Peak (Pk) value was within Average (Av) limits, not retested with Average detector.

# 4 Radiated spurious emissions data, Receive mode

**RESULT: PASS**

Date of testing: 2013-04-11

Requirements: RSS-Gen Section 6.

Spurious emissions from receivers shall not exceed the radiated limits shown in the table below.

| Frequency (MHz) | Detector | Bandwidth (kHz) | Fieldstrenght (µV/m at 3m) | Fieldstrenght (dBµV/m at 3m) |
|---|---|---|---|---|
| 30-88 | Quasi Peak | 120 | 100 | 40.0 |
| 88-216 | Quasi Peak | 120 | 150 | 43.5 |
| 216-960 | Quasi Peak | 120 | 200 | 46.0 |
| >960 | Average/Peak | 1000 | 500 | 54 / 74 |

Test procedure:

RSS-Gen 4.10: The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

Results:
See the following page.
The final measurement takes into account the loss generated by all the involved cables.

| Freq. [MHz] | Antenna Orientation | Detector | Resolution Bandwidth (Hz) | Level [dBµV/m] | Limit [dBµV/m] | Result Pass/Fail |
|---|---|---|---|---|---|---|
| 452.82 | Vertical | Qp | 120k | 33.3 | 46.0 | Pass |
| 677.68 | Vertical | Qp | 120k | 36.9 | 46.0 | Pass |
| 1080.3 | Vertical | Pk | 1M | 40.4 | 54.0 | Pass |
| 1440.7 | Vertical | Pk | 1M | 40.6 | 54.0 | Pass |
| 1662.1 | Vertical | Pk | 1M | 42.0 | 54.0 | Pass |
| 1996.4 | Vertical | Pk | 1M | 44.1 | 54.0 | Pass |

Table 2 Radiated emissions of the EUT in Receive mode operating at 915.0 MHz

The results of the radiated emission tests in the range 30 MHz to 3 GHz, carried out in accordance with 47 CFR Part 15 section 15.209 with the EUT operating in continuous transmit mode, are depicted in Table 2.

**Notes:**

1. Field strength values of radiated emissions not listed in Table 2 are more than 20 dB below the applicable limit.
2. The 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.
3. The EUT was tested in horizontal- and vertical position, highest values noted.
4. Measurement uncertainty is ±5.0dB.
5. Tested with receive frequency set at center frequency (915.0 MHz).
6. Peak (Pk) values already within Average limits, therefor not retested with Average detector.
7. Tested up to 3GHz which is more than 3 times (the maximum tunable frequency of 927.6 MHz).

# 5 Peak output power

## Results: Pass

Date of testing: 2013-04-09

Requirements:

FCC 15.247(b)(2) and RSS-210 Section A8.4 (1)

For systems using frequency hopping in the 902-928 MHz band, the maximum peak output power is 1W (+30dBm) for systems employing at least 50 hopping channels.

Test procedure:

Public notice DA 00-705 March 30, 2000 Alternative Test Procedure.

Since the EUT has no connectorport available for conducted measurements the testresults are obtained by radiated measurement using the setup for radiated emissions. From the measured radiated fieldstrenght at a distance of 3m and the antenna gain (as provided by the applicant, see attachement for datasheet) the peak conducted output power value is calculated. This value is calculated using the formula:

$P = (Ed)^2/30G$ (where E is in V/m)

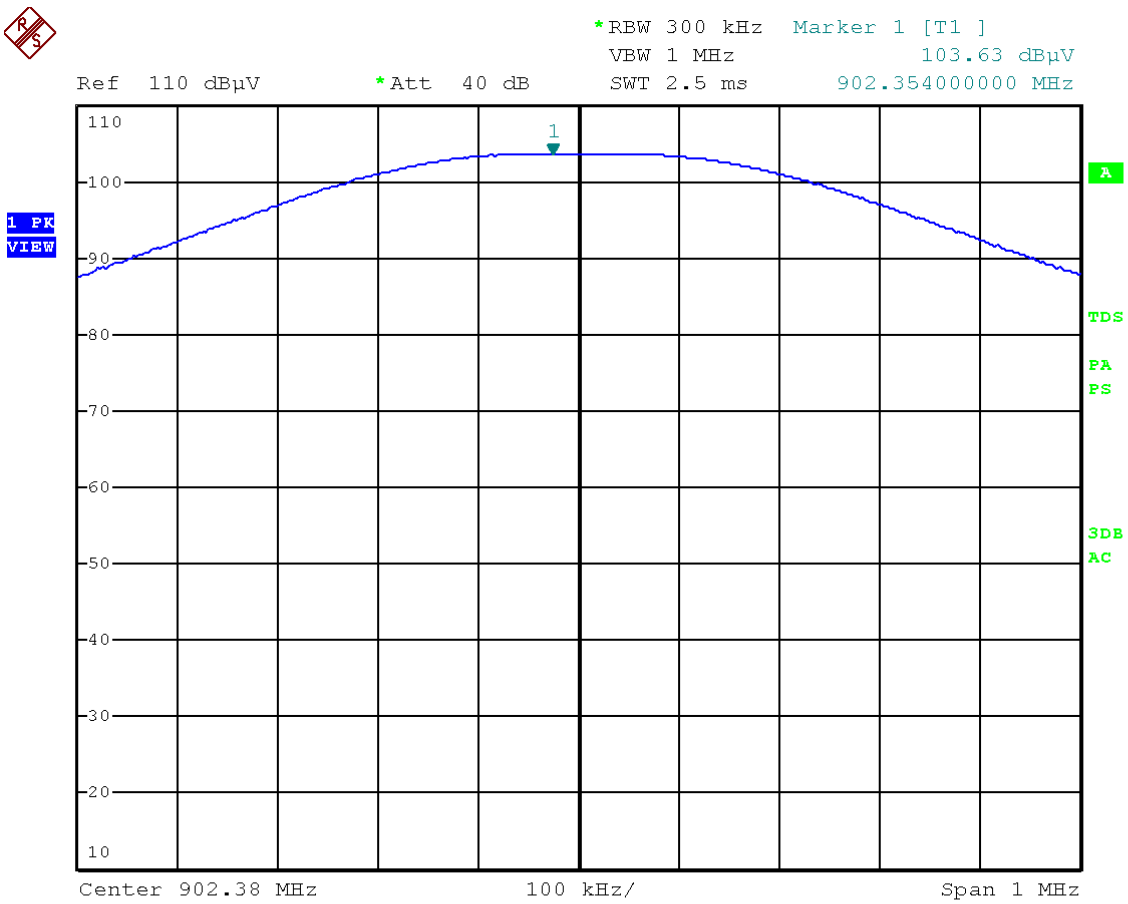
| Frequency (MHz) | Measured radiated fieldstrength (dBuv/m) | Antenna Gain (dB) | Calculated Peak output power (W) | Limit (W) |
|---|---|---|---|---|
| 902.4 | 103.63 (0.152 V/m) | -2 | 0.0110 | 1 |
| 915.0 | 103.32 (0.147 V/m) | -2 | 0.0103 | 1 |
| 927.6 | 100.87 (0.111 V/m) | -2 | 0.0059 | 1 |

Table 3 Peak output power

The results of the peak output power measurements on the EUT, carried out in accordance with 47 CFR Part 15 section 15.247(b) and FCC Public Notice DA 00-705.

**Notes:**

1. Antenna gain specified at 915MHz, this value is also used for 902.4 MHz and 927.6 MHz calculations.
2. Calculation formula derived from: $E=\frac{\sqrt{30PG}}{d}$ as given in FCC Public Notice DA 00-705
3. See plots on the next pages.

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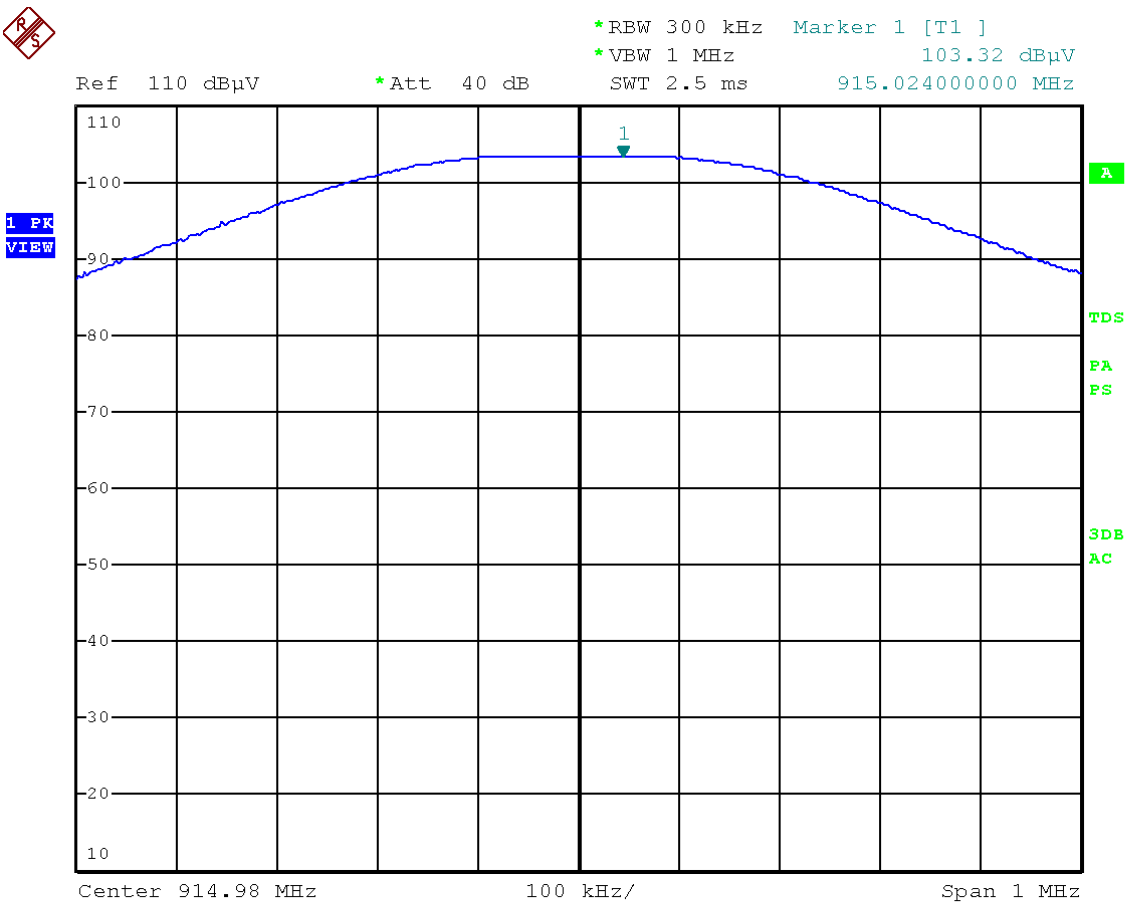
Plot 1: Output Power (902.4 MHz)

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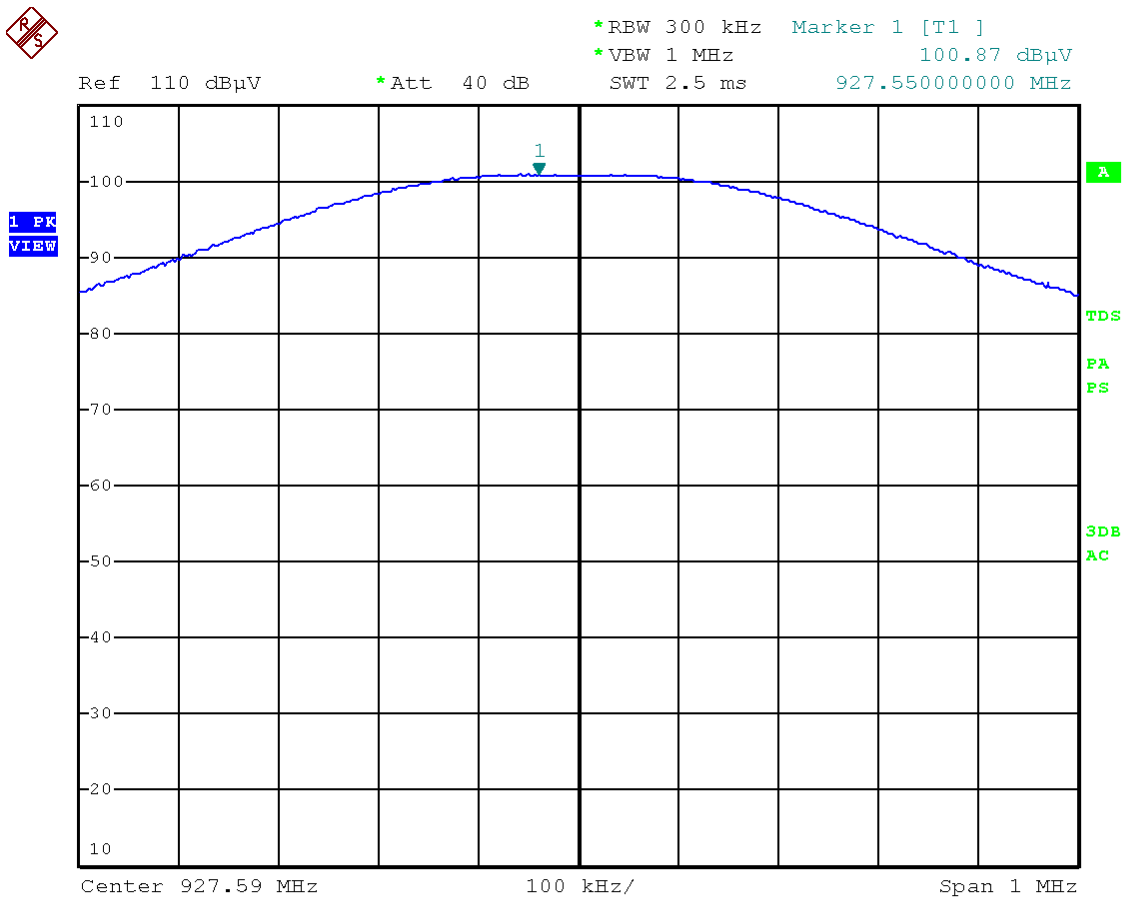
Plot 2: Output Power (915.0 MHz)

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Plot 3: Output Power (927.6 MHz)

# 6 Occupied bandwidth and 99% bandwidth

## Results: Pass

Date of testing: 2013-04-09

Requirements:

FCC 15.247(a)(1)(i) and RSS-210 Section A8.1(c).

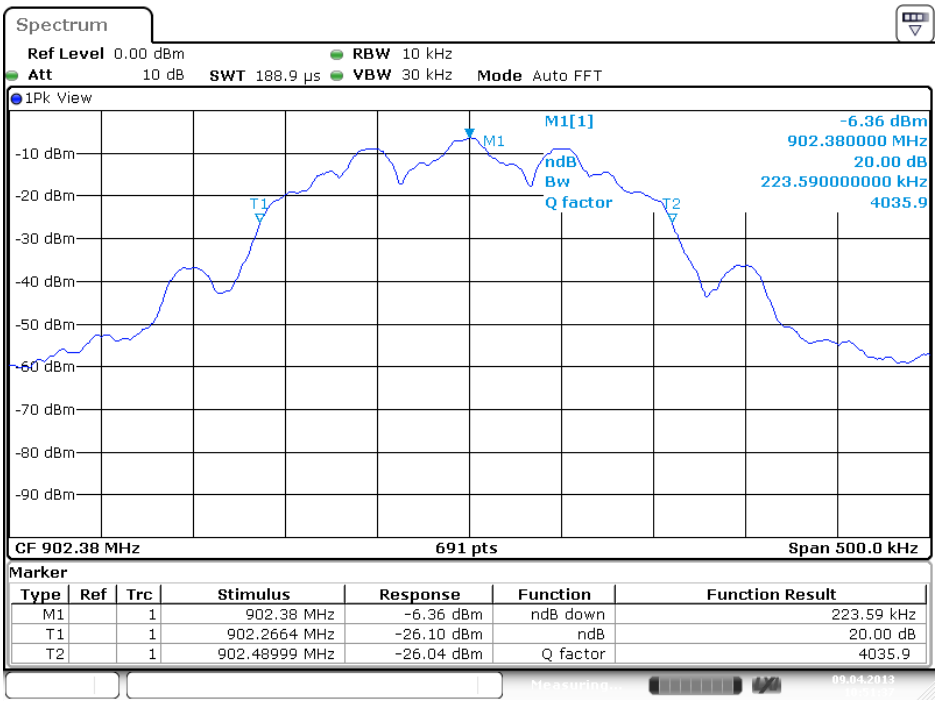
For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall have at least have 50 hopping channels and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test procedure:

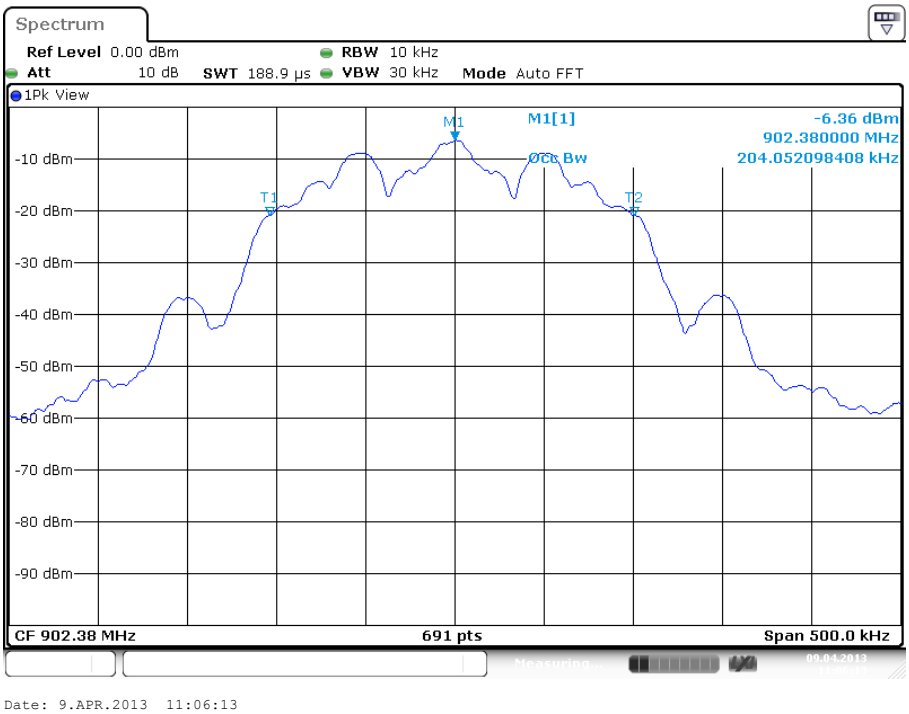
Public notice DA 00-705 March 30, 2000

The Occupied bandwidth was measured with the radiated test setup. The spectrum analyzer resolution bandwidth was set to 10kHz and the span between 2 – 5 times the emission bandwidth.

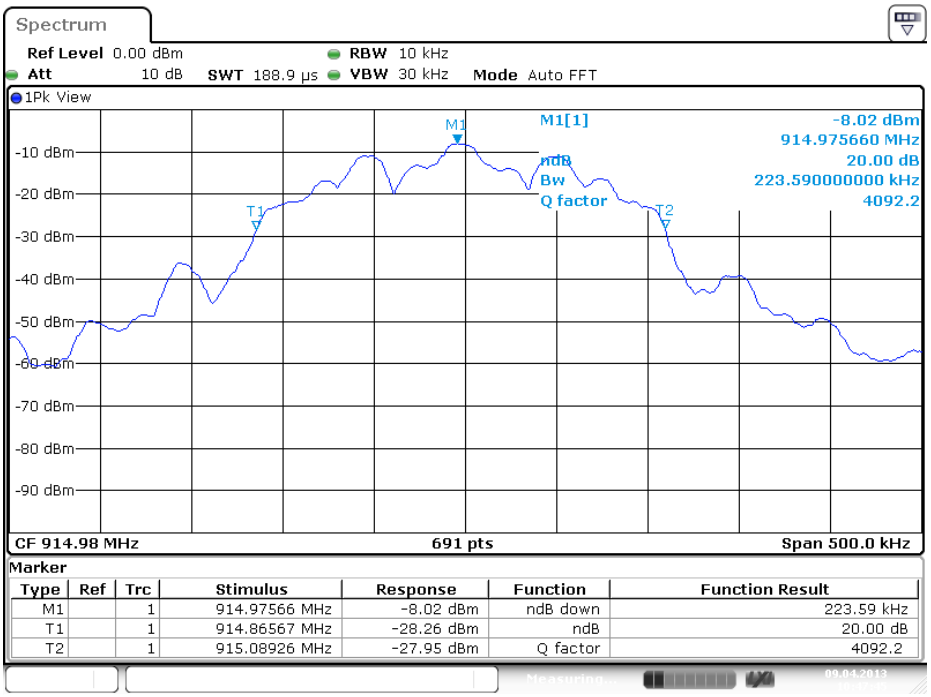
The EUT's 20 dB bandwidth was less than 250 kHz. See plots on the next pages.



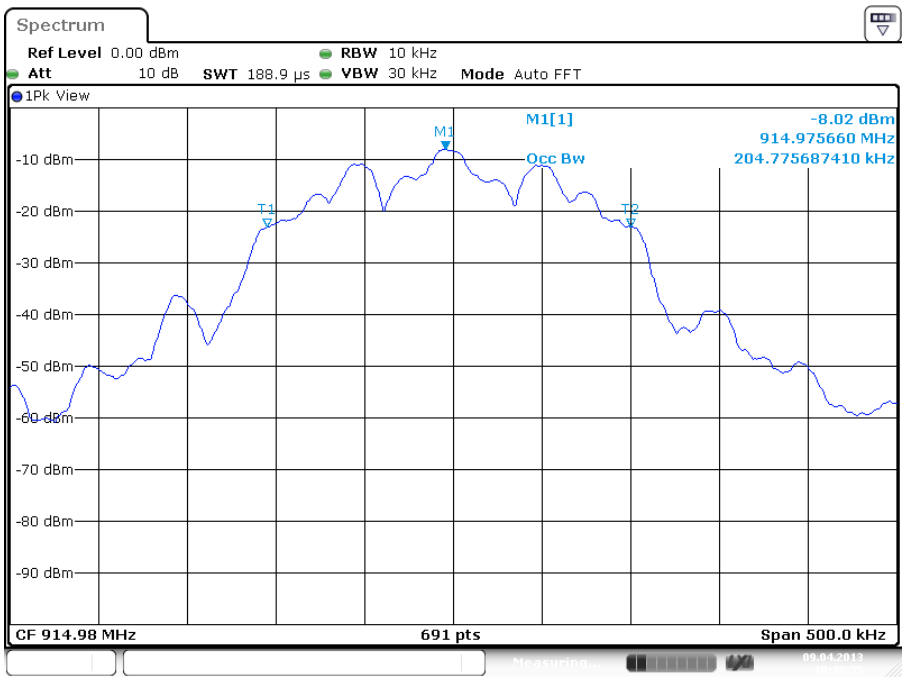

Plot 4a: Occupied 20dB Bandwidth (= 223.6 kHz) of the EUT transmitting at 902.4 MHz



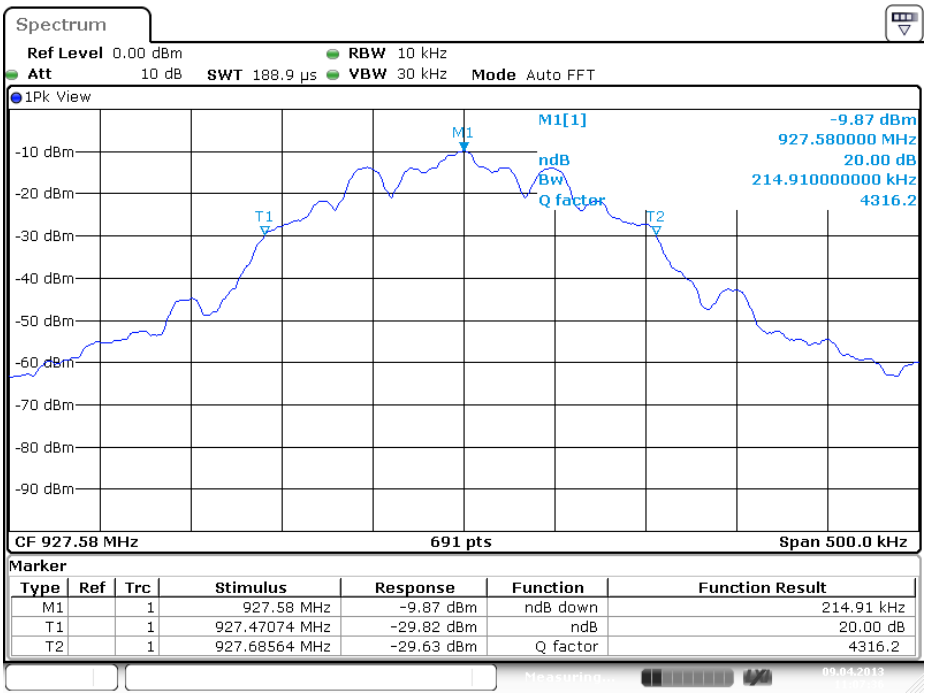

Plot 4b: 99% Bandwidth (= 204.1 kHz) of the EUT transmitting at 902.4 MHz



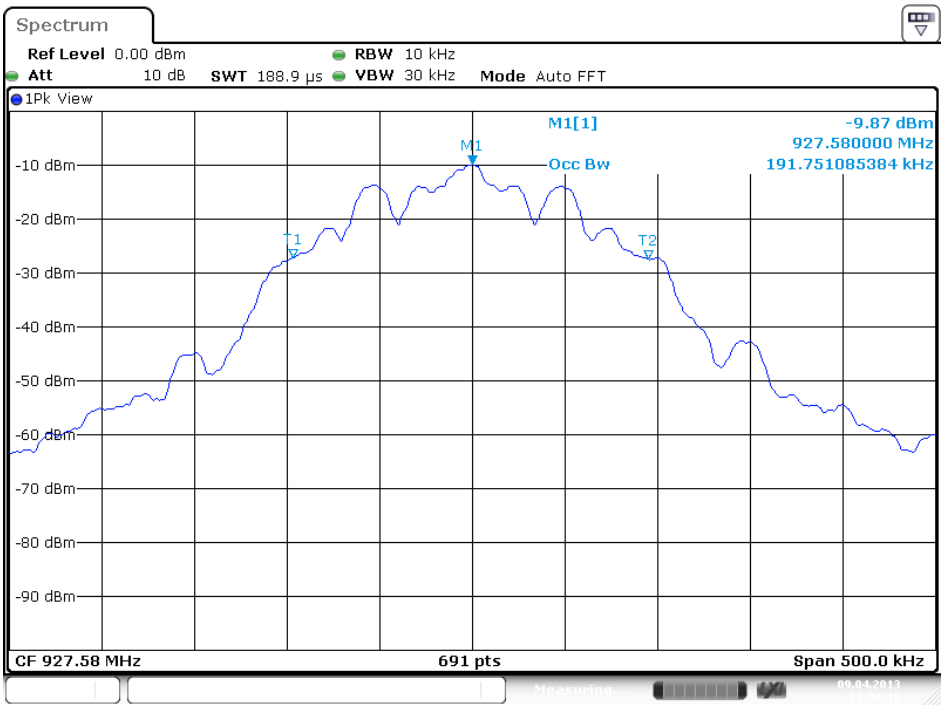

Plot 5a: Occupied 20dB Bandwidth (= 223.6 kHz) of the EUT transmitting at 915.0 MHz




Plot 5b: 99% Bandwidth (= 204.8 kHz) of the EUT transmitting at 915.0 MHz




Plot 6a: Occupied 20dB Bandwidth (= 214.9 kHz) of the EUT transmitting at 927.6 MHz




Plot 6b: Occupied 20dB Bandwidth (= 191.8 kHz) of the EUT transmitting at 927.6 MHz

# 7 Hopping frequencies, Average time of occupancy and Channel spacing.

## RESULT: PASS

Date of testing: 2013-04-09

Requirements:

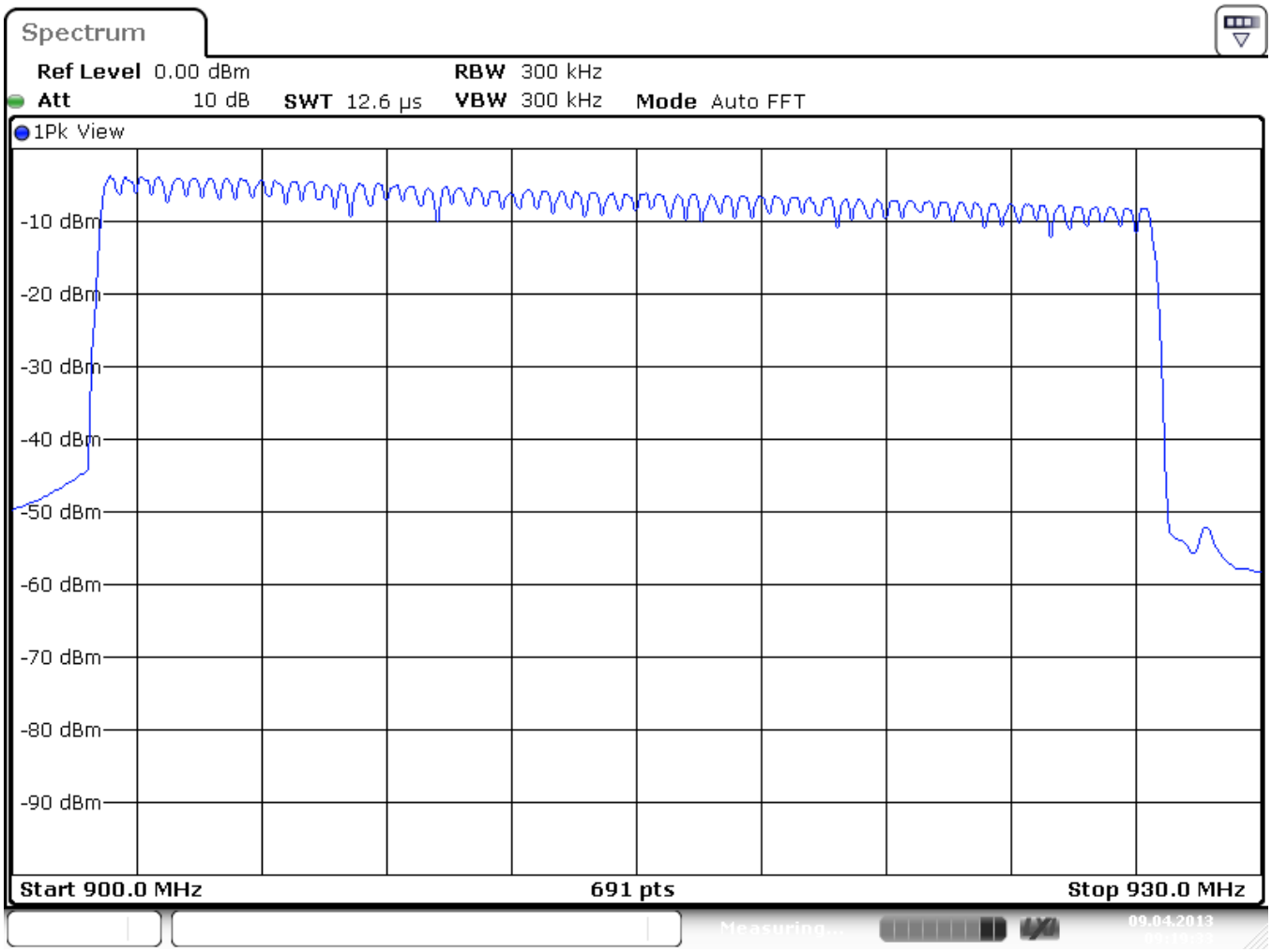
FCC 15.247(a)(1)(i) and RSS-210 A8.1(c).

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Test procedure:

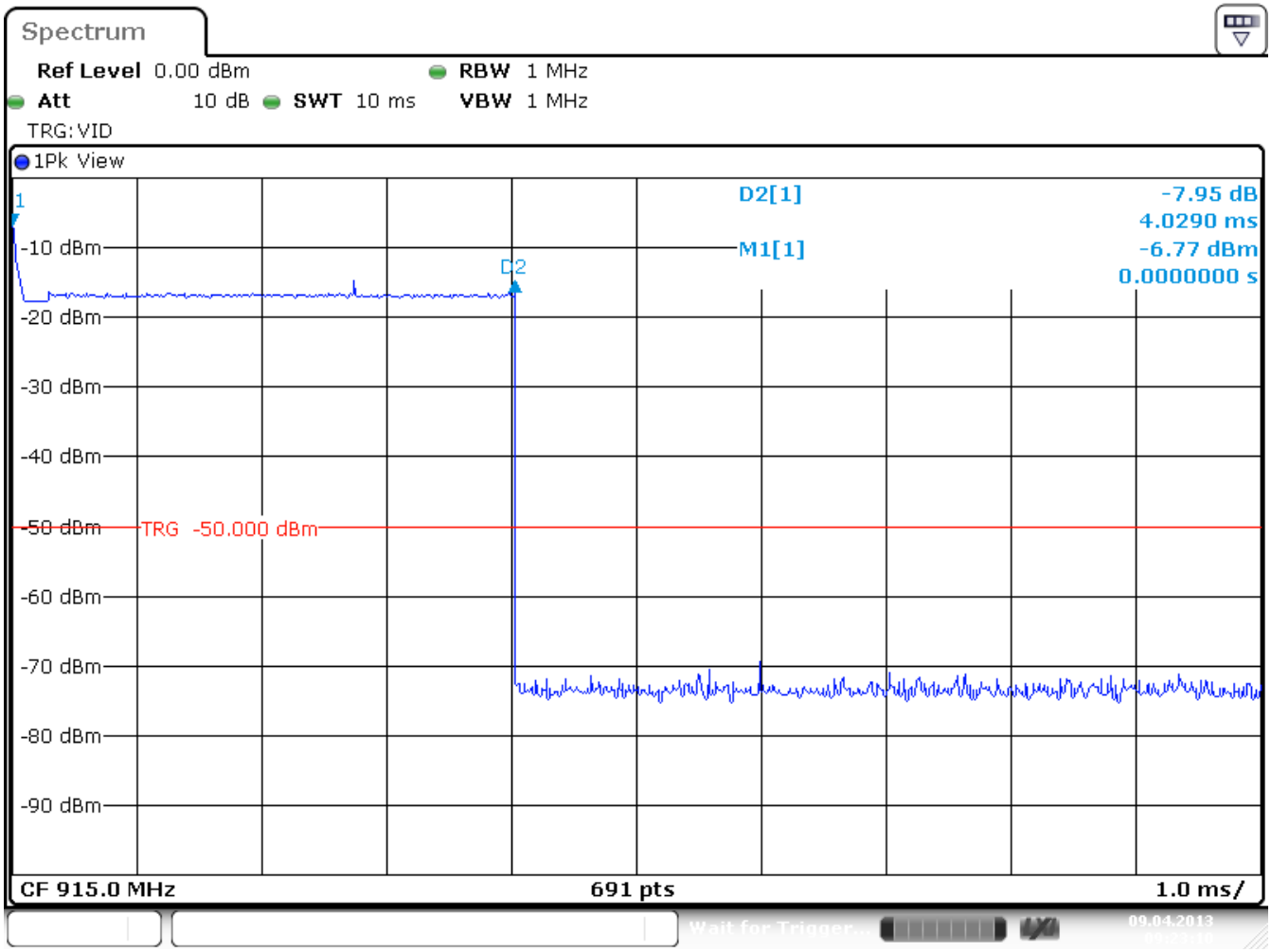
Public notice DA 00-705 March 30, 2000.

The Occupied bandwidth was measured with the radiated test setup. See plots on the next pages.




Date: 9.APR.2013 09:19:33

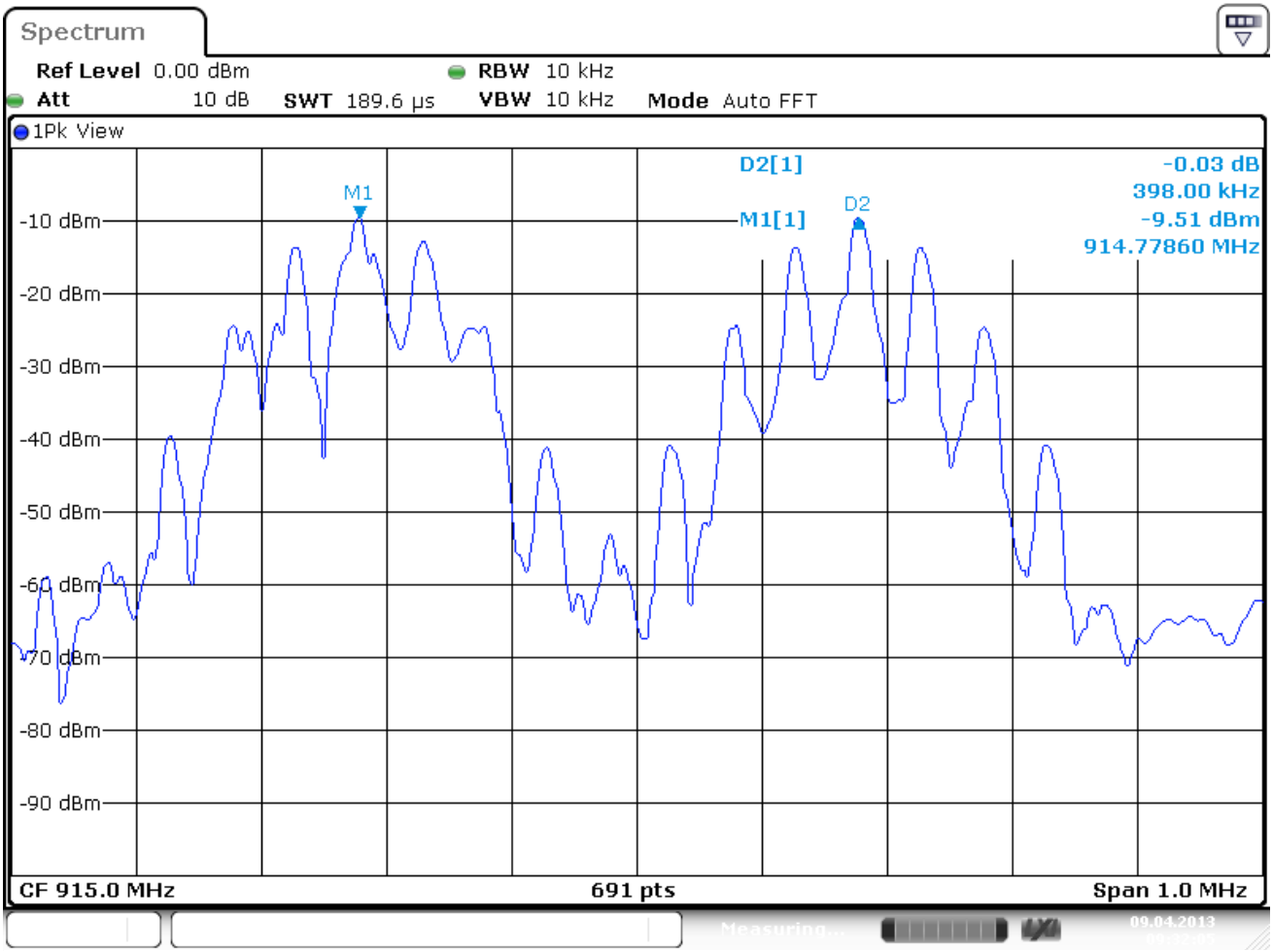
Plot 7: more than 50 (actual = 63) hopping frequencies as required by section 15.247 (1)i , as measured on a spectrum analyzer




Date: 9.APR.2013 09:23:09

Plot 8: showing Average time of occupancy <0.4 s within a 20 sec period as required by section 15.247 (1) i

Average time of occupancy (Dwell time) as measure on a spectrum analyzer. Plot 5 shows a hoplenght of 4.03 ms for 1 channel. The EUT has 63 channels for which each channel can transmit once per 253.89 ms period (63 * 4.03 ms). During an observation of 20 seconds, the channel may there for transmit 78.77 times. The average time of occupancy would therefore be 78.77 * 4.03ms = 317.44 ms, which is below the 400 ms limit.




Date: 9.APR.2013 09:32:06

Plot 9: showing approximately 400 kHz spacing between channels as measured on a spectrum analyzer, 400kHz is stated in the technical documentation.

# 8 Band edge compliance

**RESULT: Pass**

Date of testing: 2013-04-09

Requirements:

FCC 15.205, FCC 15.209, FCC 15.247(d) and RSS-210 section A8.5.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

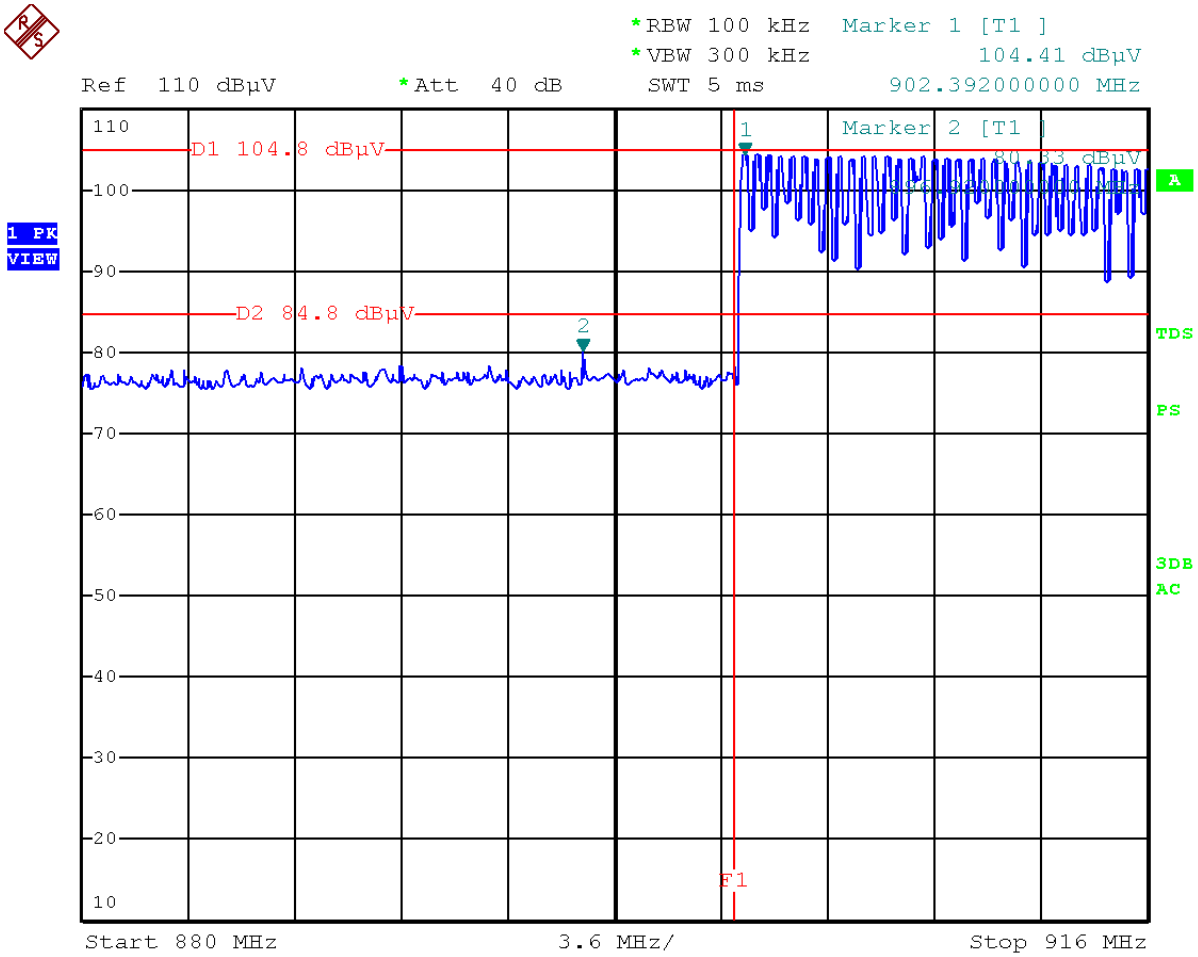
Test procedure:

ANSI C63.10: 2009.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings:
RBW = 100kHz, VBW = 100kHz.

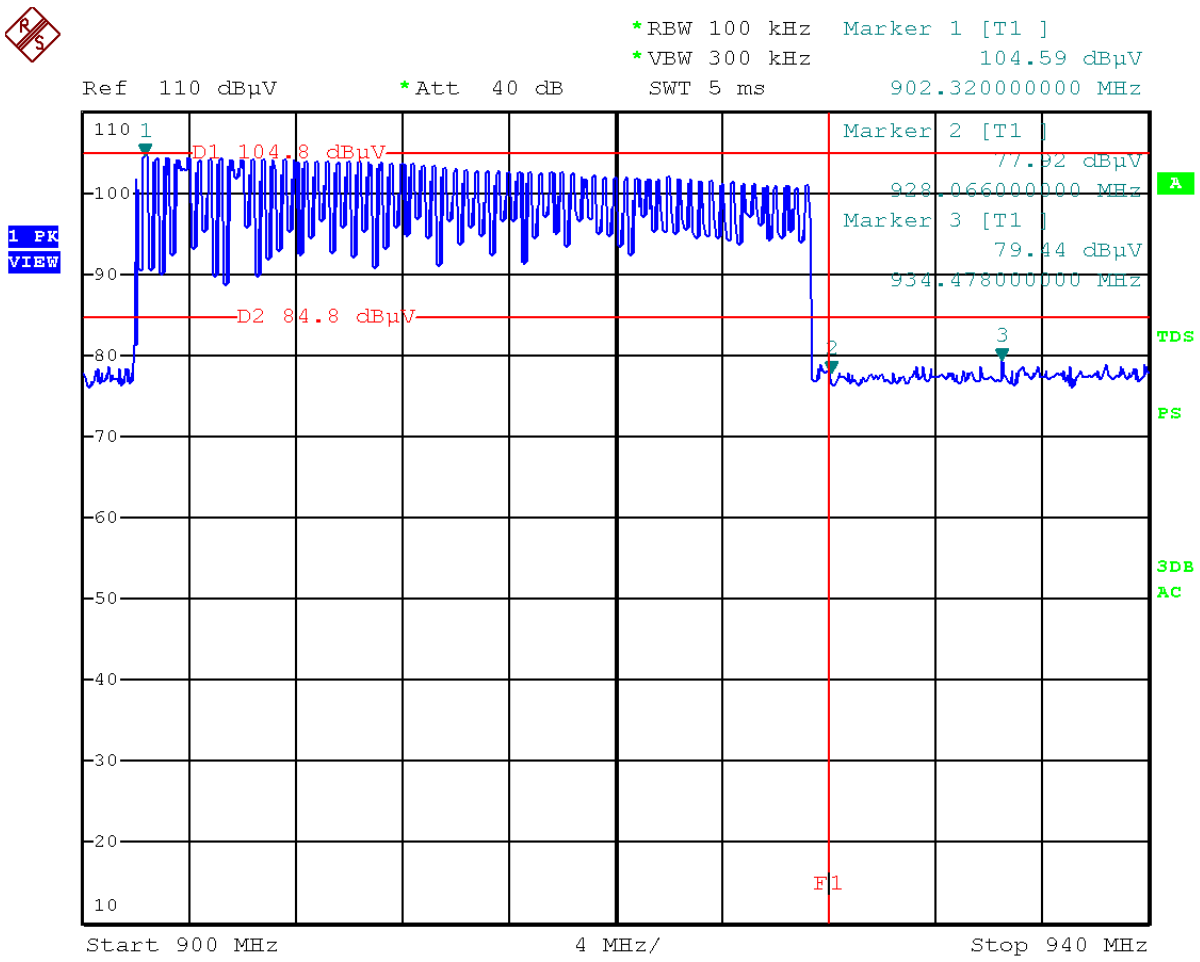
The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Results: All out of band spurious emissions are more than 20 dB below the fundamental.
See plots on the following pages.




Date: 9.APR.2013 15:27:30

Plot 10. showing more than 20 dB band edge attenuation.
F1 shows the band edge frequency of 902 MHz.




Date: 9.APR.2013 15:24:25

Plot 11. showing more than 20 dB band edge attenuation.
F1 shows the band edge frequency of 928 MHz.

# 9 List of utilized test equipment.

| Inventory number | Description | Brand | Model | Last cal. | Next cal. |
|---|---|---|---|---|---|
| 99699 | Measurement Receiver | Rohde & Schwarz | ESCI | 03/2013 | 03/2014 |
| 99858 | RF Cable S-AR | Gigalink | APG0500 | 02/2013 | 02/2014 |
| 99107 | Controller | Heinrich Deisel | 4630-100 | N/A | N/A |
| 99580 | Test fascility | Comtest | FCC listed: 90828 | 02/2012 | 02/2015 |
| 99733 | Spectrum Analyzer | Rohde & Schwarz | FSV | 05/2012 | 05/2013 |
| 99606 | Setup Radiated Emission | EMCS | RFS06S | 10/2012 | 10/2013 |
| 99608 | Controller | EMCS | DOC202 | N/A | N/A |
| 99609 | Antenna mast | EMCS | AP-4702C | N/A | N/A |
| 99855 | Temperature-Humiditymeter | Extech | SD500 | 02/2013 | 02/2014 |
| 12483 | Guidehorn 1-18 GHz | EMCO | 3115 | 04-12/2012 | 04-12/2013 |
| 15633 | Biconilog Testantenna | Chase | CBL 6111B | 01/2013 | 01/2014 |
| 12504 | Bandpass filter 1-4 GHz | BSC | MH1288 | 01/2013 | 01/2014 |
| 99076 | Bandpass filter 4-10 GHz | Reactel | 7AS-7G-6G-511 | N/A | N/A |
| 99861 | Controller Turntable | Maturo | SCU/088/ 8090811 | N/A | N/A |

NA= Not Applicable

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing.