

**TEST REPORT CONCERNING THE COMPLIANCE OF A
SPEED RADAR ANTENNA/FIELD DISTURBANCE SENSOR
OPERATING IN THE FREQUENCYRANGE
24075 – 24175 MHz,
BRAND Gatso, MODEL RT2 Radar**

**WITH 47 CFR PART 15 (10-1-12 Edition) and
RSS-Gen (issue 3, December 2010) and
RSS-210 (Issue 8, December 2010)**

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

**TÜV Rheinland EPS
P.O. Box 37
9350 AA Leek (NL)
Eiberkamp 10
9351 VT Leek (NL)**

Telephone: +31 594 505005
Telefax: +31 594 504804

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

MEASUREMENT/TECHNICAL REPORT

Gatso
Model : RT2 Radar

FCC ID: TVO-RT2
IC: 6271A-RT2

This report concerns: Original grant, certification, Modular approval ~~Class 2 change~~ ~~Verification~~

Equipment type: FDS Field Disturbance Sensor

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) and RSS-210 (Issue 8, December 2010) and the measurement procedures of ANSI C63.10-2009. TÜV Rheinland EPS 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: August 15, 2013

Signature:



O. Hoekstra
Senior Engineer Telecom TÜV Rheinland EPS

Description of test item

Test item : Speed Radar Antenna / Field Disturbance Sensor
operating in the range 24075-24175 MHz
Manufacturer : Gatsometer BV
Brand : Gatso
Model : RT2 Radar
Serial number : 20120700011
Revision : n.a.

Applicant information

Applicant's representative : Mr. B. van de Pavert
Company : Gatsometer BV
Address : Claes Tillyweg 2
Postal code : 2031CW
City : Haarlem
Country : The Netherlands
Telephone number : +31 23 5255050
Telefax number : +31 23 5276961
E-mail : b.vandepavert@gatso.com

Test(s) performed

Location : Leek
Test(s) started : July 26, 2013
Test(s) completed : August 12, 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 : August 15, 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.

The brand Gatso, model RT2 Radar (hereafter referred to as EUT), is used in the Speed Inforcement System and is designed to operate in the 24 GHz frequency band (24075 MHz to 24175 MHz). The EUT is a FSK modulated transmitter with shifts ± 1.9 MHz around the center frequency.

1.1.1 Introduction.

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 Equipment Authorization (original grant/certification) in equipment authorization files under **FCC ID: TVO-RT2** and **IC: 6271A-RT2**.

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	:	Speed Radar Antenna- Filed Disturbance Sensor
Manufacturer	:	Gatsometer BV.
Brand	:	Gatso
Model	:	RT2
Serial number	:	20120700011
Voltage input rating	:	12Vdc
Voltage output rating	:	--
Current input rating	:	not provided
Antenna	:	Internal, declared Gain= 10 dBi
Remarks	:	--

Auxiliary equipment (AUX1)	:	Multifunction DAC/Simulator
Manufacturer	:	National Instruments
Brand	:	National Instruments
Model	:	USB X Series
Serial number	:	--
Voltage input rating	:	10.8 – 15.0 VDC
Voltage output rating	:	--.
Remark	:	used to simulate vehicles

Auxiliary equipment 2 (AUX2)	:	Notebook computer with power supply adapter
Brand	:	Dell
Model	:	Latitude
Serial number	:	515XLQ1
Voltage input rating	:	12 Vdc
Current input rating	:	--
Remark	:	used for programming the EUT, property applicant

Auxiliary equipment 3 (AUX3) : CAN-USB connection device
Brand : PEAK System
Model : IPEH-002021
Serial number : 111674
Current input rating : --
Voltage output rating : --
Current output rating : --
Remarks : used to convert CAN to USB

Auxiliary equipment 4 (AUX4) : DC Power Supply
Manufacturer : Delta Electronics B.V.
Brand : Delta
Model : E030-3
Voltage input rating : 100 – 240 Vac
Current input rating : --
Voltage output rating : 0 – 30 Vdc
Current output rating : 3A max
Remarks : Power supply for EUT

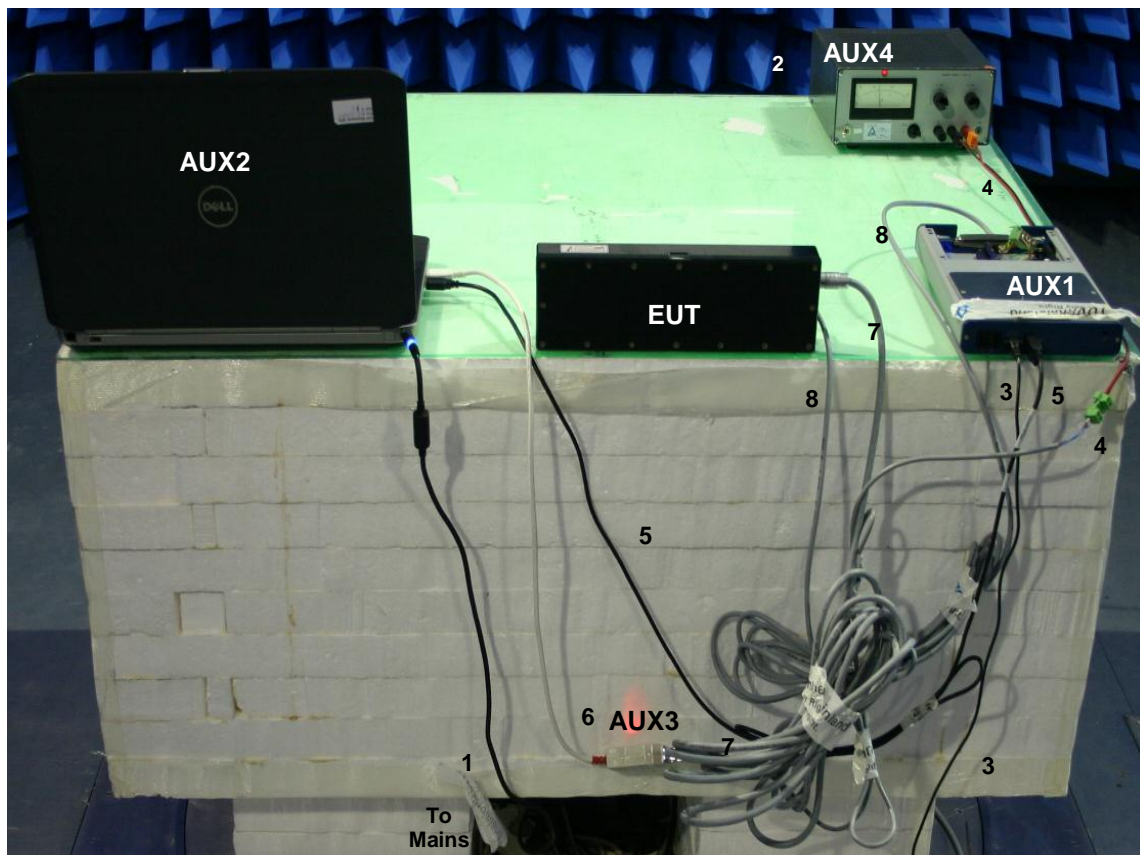


Photo 1: basic setup

1.3.1 Description of input and output ports.

Number	Terminal	From	To	Remarks	
1	Mains	Mains	AUX2	Unshielded cable <3m length	
2	Mains	Mains	AUX4	Unshielded cable <3m length	
3	Mains	Mains	AUX1	Unshielded cable <3m length	
4	12Vdc	AUX4	EUT	Unshielded cable <3m length	
5	comms	AUX1	AUX2-usb port 2	Shielded cable <3m length	
6	comms	AUX3	AUX2-usb port 1	Shielded cable <3m length	
7	Comms	AUX1	AUX3	Shielded cable <3m length	
8	comms	AUX1	EUT	Shielded cable <3m length	

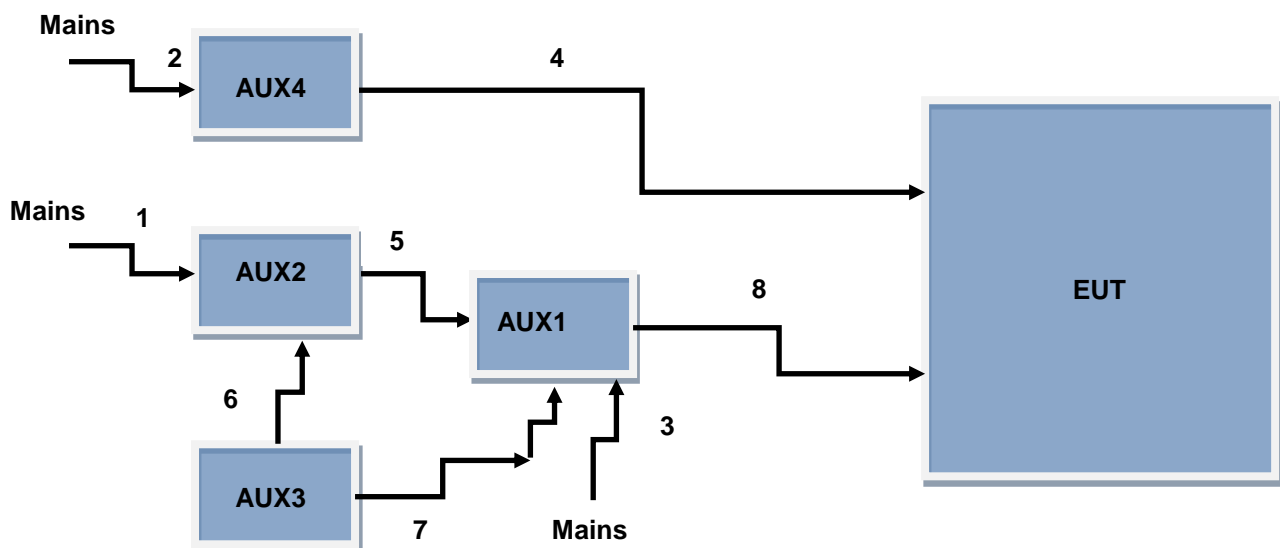


Figure 1. Basic set-up

1.4 Test results 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 (10-1-12 Edition)	RSS-210 Issue 8, December 2010			
15.205 and 15.209	RSS-Gen(4.9, 7.2.2 and 7.2.5) and RSS-210(2.5)	Radiated emissions, including restricted bands	12 - 15	Pass
15.215(c)	RSS-Gen(4.6.1)	Occupied bandwidth	16 - 19	Pass

Table : testspecifications

Testmethods: ANSI C63.10-2009 and RSS-Gen Issue 3, December 2010

1.5 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (10-1-12 Edition), sections 15.31, 15.205, 15.207, 15.209 and 15.245, RSS-GEN (ISSUE 3, DECEMBER 2010) RSS-210 (ISSUE 8, DECEMBER 2010).

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

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	: 120VAC/60Hz to the AC/DC Power Supply
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).

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 continues transmit mode with a modulated carrier. The output power was set for maximum output by the applicant. The intentional radiator tests have been performed with a complete functioning EUT and interconnections.

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 Labeling

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.

2.9 Tests software

The applicant has provided the following testsoftware on AUX3 to enable control over testparameters. Only frequencies could be selected in the form of Setting 2 and Setting 3. Power level is set at maximum by default.

Testsoftware: TCAN Simulator

Version:

Use: turn EUT TX On/Off

Testsoftware: PCAN-view

Version:

Use: monitoring datatraffic

Testsoftware: RTxEmulator

Version:

Use: simulates a speeding vehicle

Testsoftware: CANopen Device Monitor

Version: 3.2.4

Use: setting the frequency

2.10 Test modes

Test channel	Remark
Setting 1	Not used for USA and Canada
Setting 2	Frequency = 24080 MHz
Setting 3	Frequency = 24100 MHz
Setting 4	Not used for USA and Canada

Note: EUT is based on a free running VCO and actual frequency may differ.

3 Radiated emission data.

RESULT: Pass

Date of testing: 2013-08-08 and 2013-08-12

Frequency range: 30MHz - 40GHz

Requirements:

FCC 15.205, FCC 15.209, FCC 15.245 and IC RSS-Gen(4.9, 7.2.2 and 7.2.5) and RSS-210(Annex 7)

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).

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated at least 50 dB below the level of the fundamental or to the general radiated emissions limits specified in FCC 15.209(a)/ RSS-Gen (7.2.5), whichever is the lesser attenuation.

Test procedure:

ANSI C63.10-2009.

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 up to a maximum of 100 GHz. 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 test from 1GHz up to 40GHz were performed at our facility in Leek, the Netherlands. Tests from 40GHz up to 100GHz were performed at:

CETECOM ICT Services GmbH / Untertuerkheimer Str. 6-10 / 66117 Saarbruecken / Germany.

3.1 Radiated field strength measurements (30 MHz – 1 GHz, E-field)

3.1.1 Radiated field strength measurements (30 MHz- 1 GHz, E-field)

Freq. [MHz]	Antenna Orientation	Level QP [dBμV/m]	Limit [dBμV/m]	Result Pass/Fail
148.34	Vertical	30.8	43.5	Pass
299.66	Vertical	26.9	46.0	Pass
400.54	Vertical	16.1	46.0	Pass
499.48	Vertical	23.1	46.0	Pass
538.28	Vertical	25.8	46.0	Pass
800.18	Vertical	23.6	46.0	Pass

Table 1 Radiated emissions of the EUT in the frequency range 30 MHz – 1 GHz.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209, 15.249 and RSS-210 section A2.9 and RSS-Gen section 7.2.5 with the EUT operating in continues transmit mode are depicted in Table 1.

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
2. Measurement uncertainty is ± 5.0 dB
3. 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).
4. The EUT was tested on Setting 2 and Setting 3 in the 24075 – 24175 MHz band wherein it operates.
5. A Quasi-peak detector was used with a resolution bandwidth of 120 kHz.

Used test equipment and ancillaries:

99608	99699	99609	99861	99858	99580/99847	99877	99045	

3.2 Radiated field strength measurements (1 - 40 GHz, E-field)

3.2.1 Radiated field strength measurements (1 - 40 GHz, E-field), EUT's TX: Setting 2

Frequency [MHz]	Antenna Orientation	Detector	Resolution Bandwidth (kHz)	Level [dBm]	Limit Av/Pk [dBm]*1	Result
3332	Vertical	Peak	1000	-51.7	-41.2 / -21.2	Pass
3697	Vertical	Peak	1000	-51.0	-41.2 / -21.2	Pass
4192	Vertical	Peak	1000	-55.9	-41.2 / -21.2	Pass
5038	Vertical	Peak	1000	-49.1	-41.2 / -21.2	Pass
5390	Vertical	Peak	1000	-54.5	-41.2 / -21.2	Pass
8646	Vertical	Peak	1000	-53.2	-41.2 / -21.2	Pass
12656	Vertical	Peak	1000	-51.6	-41.2 / -21.2	Pass
14149	Vertical	Peak	1000	-48.0	-41.2 / -21.2	Pass
17171	Vertical	Peak	1000	-45.5	-41.2 / -21.2	Pass
24078 (fundamental)	Vertical	Peak	1000	108.32 dBμV/m	128 dBμV/m (Av) 148 dBμV/m (Pk)	Pass

Table 2

3.2.2 Radiated field strength measurements (1 - 40 GHz, E-field), EUT's TX: Setting 3

Frequency [MHz]	Antenna Orientation	Detector	Resolution Bandwidth (kHz)	Level [dBm]	Limit Av/Pk [dBm]*1	Result
3332	Vertical	Peak	1000	-51.7	-41.2 / -21.2	Pass
3697	Vertical	Peak	1000	-51.0	-41.2 / -21.2	Pass
4192	Vertical	Peak	1000	-55.9	-41.2 / -21.2	Pass
5038	Vertical	Peak	1000	-49.1	-41.2 / -21.2	Pass
5390	Vertical	Peak	1000	-54.5	-41.2 / -21.2	Pass
8646	Vertical	Peak	1000	-53.2	-41.2 / -21.2	Pass
12656	Vertical	Peak	1000	-51.6	-41.2 / -21.2	Pass
14149	Vertical	Peak	1000	-48.0	-41.2 / -21.2	Pass
17171	Vertical	Peak	1000	-45.5	-41.2 / -21.2	Pass
24104 (fundamental)	Vertical	Peak	1000	108.20 dBμV/m	128 dBμV/m (Av) 148 dBμV/m (Pk)	Pass

Table 3

Note *1: Derived from the expression $\text{dBm} = \text{dB}\mu\text{V/m} - 95.2\text{dB}$.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209 and 15.245 and RSS-210 section Annex 7 and RSS-Gen section 7.2.5 with the EUT operating in continues transmit mode (Cont. TX) are depicted in Tables 2 and Table 3.

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
2. Measurement uncertainty is ± 5.0 dB
3. 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).
4. The EUT was tested on Setting 2 and Setting 3 in the 24075– 24175 MHz band wherein it operates.
5. Peak values were within Average limits, therefor not retested with Average detector.

Used test equipment and ancillaries:

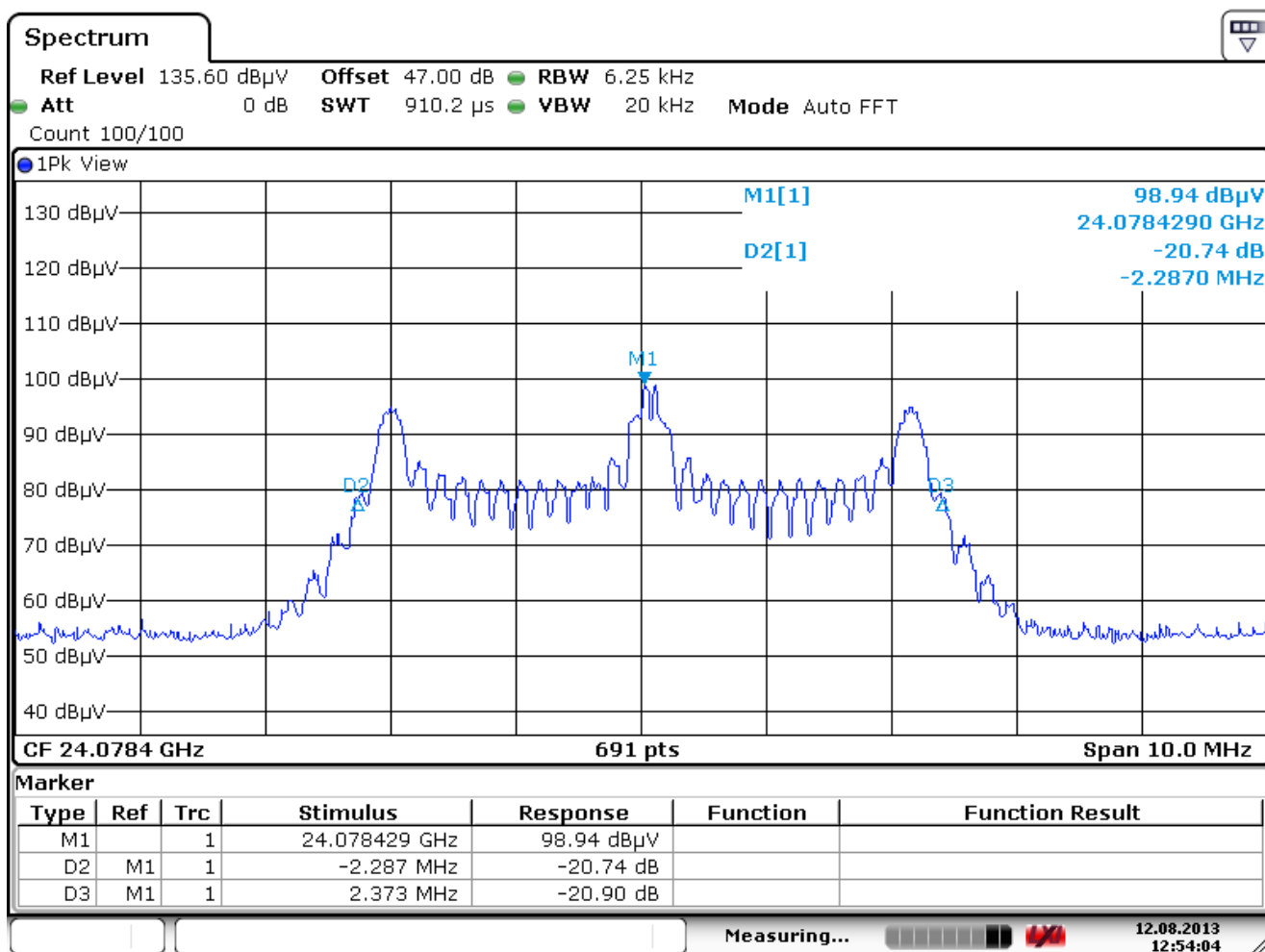
99608	99699	99847	99861	99858	99580/99847	99609	99045	99742
99710	12483	12486	99538					

4 Bandwidth of the emission

RESULT: Pass

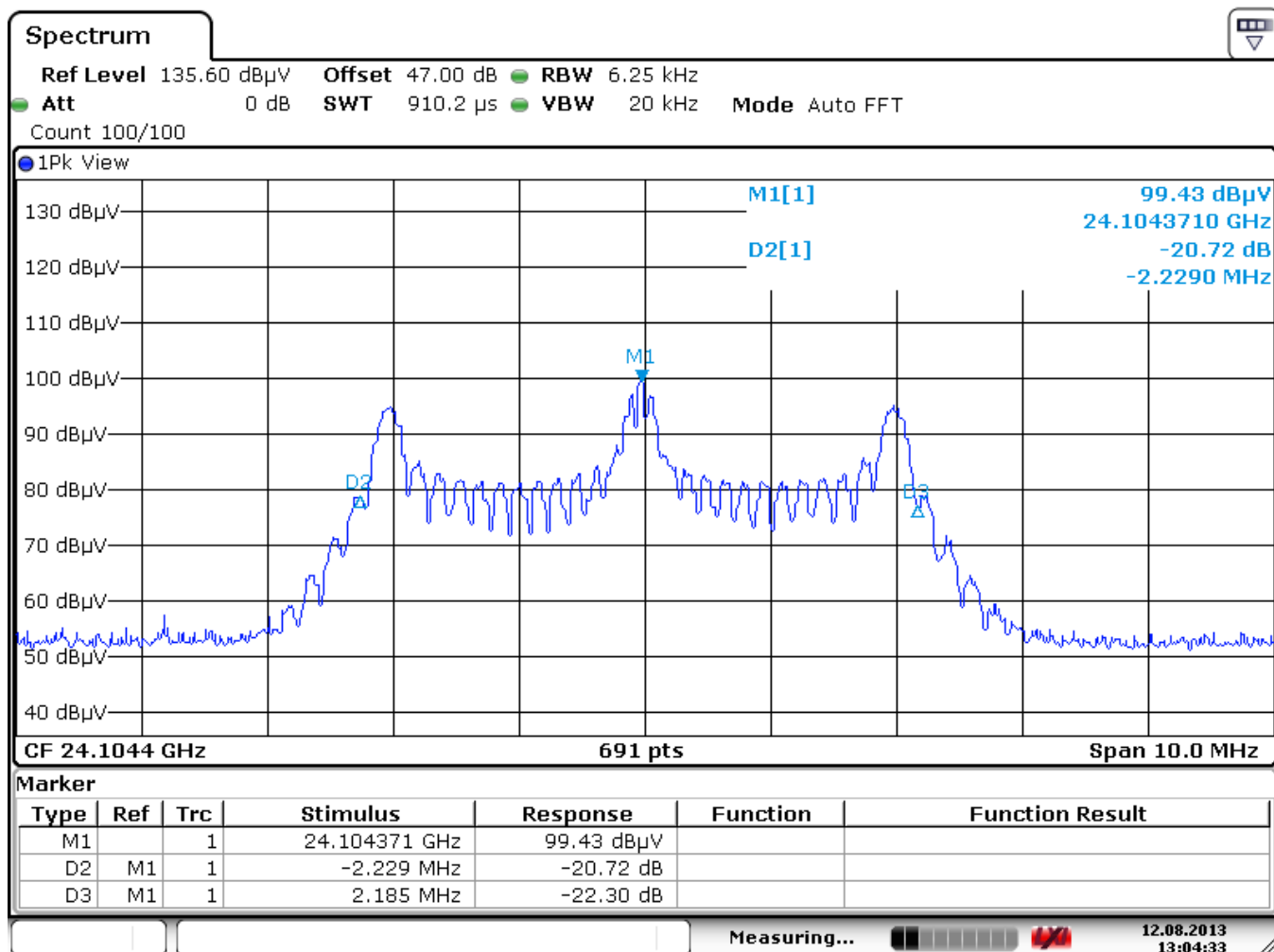
Date of testing: 2013-08-12

The plots below show 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 15.245 and RSS-210 Annex 7.



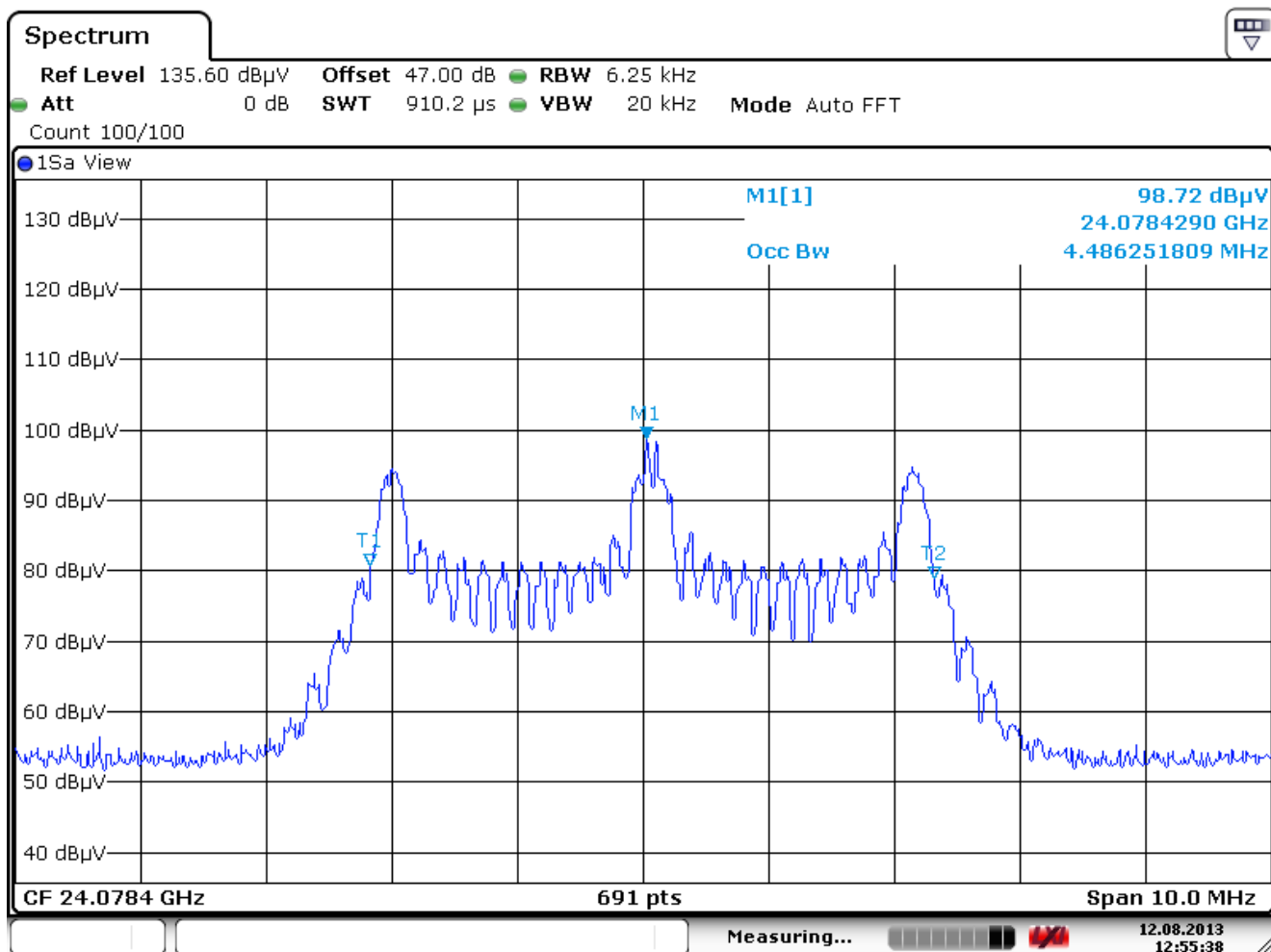
Date: 12.AUG.2013 12:54:04

Plot Setting 2, Occupied bandwidth is 4660 kHz as measured on a spectrum analyzer.



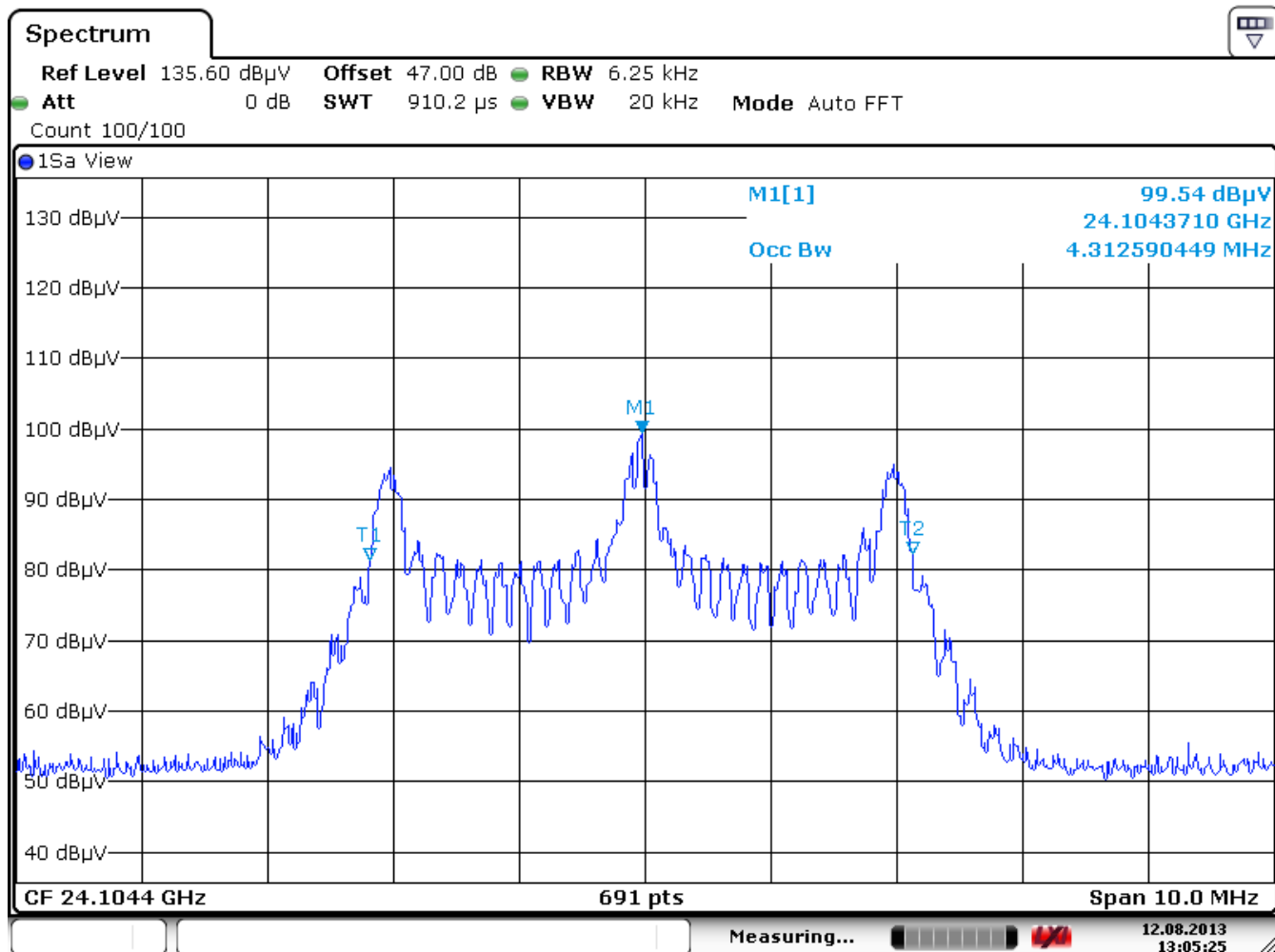
Date: 12.AUG.2013 13:04:33

Plot Setting 3, Occupied bandwidth is 4414 kHz as measured on a spectrum analyzer.



Date: 12.AUG.2013 12:55:38

Plot Setting 2, 99% bandwidth is 4486 kHz as measured on a spectrum analyzer.



Date: 12.AUG.2013 13:05:25

Plot Setting 3, 99% bandwidth is 4313 kHz as measured on a spectrum analyzer.

5 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
99045	Power Supply	Delta	E030-3	04/2013	04/2014
99742	RF Cable	S+H	Sucotest 18/ Sucoflex 102	04/2013	04/2014
12483	Guide horn antenna 1-18GHz	Emco	3115	04/2013	04/2014
12486	Guide horn antenna 18-40GHz	Emco	3116	04/2013	04/2014
99877	Biconilog Test antenna	Teseq	CBL 6111B	06-2013	06-2014
99161	Variac 250V 6A	RFT	LTS006	NA	NA
99538	Spectrum Analyzer	R&S	FSP	12/2012	12/2013
99580/ 99847	Semi Anechoic Room	Siepel	FCC listed: 90828 IC: 2932G-2	12-2011	12-2014
99608	Antenna mast controller	EMCS	DOC202	NA	NA
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99742	RF Cable S-AR	Gigalink	APG0500	01/2013	01/2014
99847/ 99852/ 99855	Temperature-Humiditymeter	Extech	SD500	02-2013	02-2014
99858	RF Cable S-AR	Gigalink	APG0500	01/2013	01/2014
99861	Controller turntable	Maturo	SCU/088/8090811	NA	NA
99699	Measuring receiver	R&S	ESCI	03-2013	03-2014

NA= Not Applicable