Test report no. : 205254-5

Item tested : 8650202 Dosimetry Radio

Type of equipment : Low power Transceiver 918.3 MHz

FCC ID : XWK8650202

Client : Unfors RaySafe AB

FCC Part 15.249
Low Power Transceiver
902-928 MHz Band

RSS-210, Issue 8 and RSS-GEN, Issue 3
Low-Power License-exempt Radio communications devices
902 – 928 MHz Band

9 January 2013

Authorized by : .....
G. Suhanthakumar
Technical Verificator

CONTENTS

1 GENERAL INFORMATION

1.1 Testhouse Info

Name :	Nemko AS
Address :	Nemko Kjeller Instituttveien 6, Box 96 NO-2027 Kjeller, NORWAY
Telephone :	+47 64 84 57 00
Fax :	+47 64 84 57 05
Email:	comlab@nemko.no
FCC test firm :	994405
IC OATS :	2040D-1
Total Number of Pages:	27

1.2 Client Information

Name :	Unfors RaySafe AB
Address :	Uggledalsvägen 29, SE-427 40 Billdal, Sweden
Telephone :	+46
Fax :	+46

Contact:

Name :	Stefan Horn
Telephone :	+1 508 596 0978
E-mail :	stefan.horn@raysafe.com

1.3 Manufacturer

Same as client

2 Test Information

2.1 Test Item

Name :	Unfors Raysafe
Model/version :	8650202 Dosimetry Radio
FCC ID:	XWK8650202
IC ID:	9038A-8650202
Serial number :	192181 (for radiated measurements) 192182 (for conducted measurements)
Hardware identity and/or version:	-
Software identity and/or version :	-
Frequency Range :	918.3 MHz
Operating Frequency:	918.3 MHz
Number of Channels :	1
Operating Modes :	TX & RX
Type of Modulation :	Digital (GFSK)
Data rate:	-
User Frequency Adjustment :	None
Conducted Output Power :	0.0008 Watts
Type of Power Supply :	USB power (nominal 5V)*
Antenna Connector :	None (for conducted testing purpose)
Antenna type:	Integral chip antenna
Antenna Diversity Supported :	N/A

(*) Tested with a PC. Internal operated power is 3.3V DC.

Description of Test Item

The Dosimetry Radio is a transceiver USB radio. It is based on a system on-chip device with an integral chip antenna.

2.2 Test Environment

2.2.1 Normal test condition

Temperature:	20 – 22 °C
Relative humidity:	30 – 50 %
Normal test voltage:	5.0 V DC (powered from USB port of computer)

The values are the limit registered during the test period.

2.3 Test Period

Item received date:	2012-09-05
Test period :	from 2012-09-06 -2012-09-07

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Unfors RaySafe

Model No.: 8650202 Dosimetry Radio

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15.249.

All tests were conducted in accordance with ANSI C63.4-2003 and KDB 558074 D01 DTS Measurement Guidance v01.

Radiated tests were made in a semi-anechoic chamber at measuring distances of 3m and 10m.

A description of the test facility is on file with the FCC and Industry Canada.

☒ New Submission ☒ Production Unit

☐ Class II Permissive Change ☐ Pre-production Unit

DXT Equipment Code ☐ Family Listing

THIS TEST REPORT RELATES ONLY TO THE ITEM (S) TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

TEST REPORT #: 205254-5

TESTED BY: _____ DATE: 2012-09-19

Thomas Danglé, Test engineer

3.2 Test Summary

Name of test	FCC Part 15 reference	RSS210 Issue 8 & RSS Gen Issue 3	Result
Supply Voltage Variations	15.31(e)	4.5 (RSS-GEN)	N/A [1]
Antenna Requirement	15.203	7.1.4 (RSS-GEN)	N/A [2]
Power-line Conducted Emissions	15.207(c)	7.2.2 (RSS-GEN)	Complies [1]
OBW/ 20dB bandwidth	-	4.6.1 (RSS-GEN)	No requirements
Peak Power Output	15.249(a)(c)	A2.9	Complies
Spurious Emissions (Radiated)	15.249 (e)	A2.9 4.3 (RSS-GEN)	Complies

[1] The power is taken from a PC USB port, 5 VDC and the internal operating voltage is 3.3V.

[2] Integral chip antenna

[3] Single channel device

RSS Gen issue 3 covers section 7 & 6

RSS 210 issue 8 covers section A2.9

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

A labtop-computer is used to power the EUT via USB port. A test software activates the EUT into test mode . For spurious emission measurements the EUT is place directly into an USB port of the PC without any cable. For radiated measurement the EUT is feed with power from the PC via an USB cable. The PC is placed inside the test chamber but far away from the EUT. The PC was running by it's battery.

The radiated measurements are tested on three axis.

3.5 Family List Rationale

Not Applicable.

4 TEST RESULTS

4.1 Occupied Bandwidth

Para. No.: RSS-Gen

Test Performed By: T.Danglé	**Date of Test: 07-Sept-2012**

Test Results: Complies

See also plots below.

Measurement Data:

Data Rate	**OBW (kHz)**
	918.3 MHz
-	264.4

Requirements:

For information only

Date: 7.SEP.2012 10:10:15

918.3 MHz – OBW

4.2 Peak Power Output

Para. No.: 15.249 (a)/A.2,9

Test Performed By: T.Danglé	**Date of Test: 06 - 07-Sept-2012**

Test Results: Complies

Measurement Data:

Maximum Conducted Peak Output Power

RF channel	**918.3 MHz**
Measured value (dBm)	-0.96

Maximum Field strength

RF channel	**918.3 MHz**
VP: Measured value (dBµV/m)	87.94
HP: Measured value (dBµV/m)	89.42

Calculated erp & antenna gain

RF channel	**918.3 MHz**
Radiated power (mW)	0.16
Radiated erp (dBm)	-7.96
Antenna gain dBd	-7.00

Radiated measurements were performed at 3 m distance.

Antenna gain = 10*log(EIRP/Conducted power) dBi

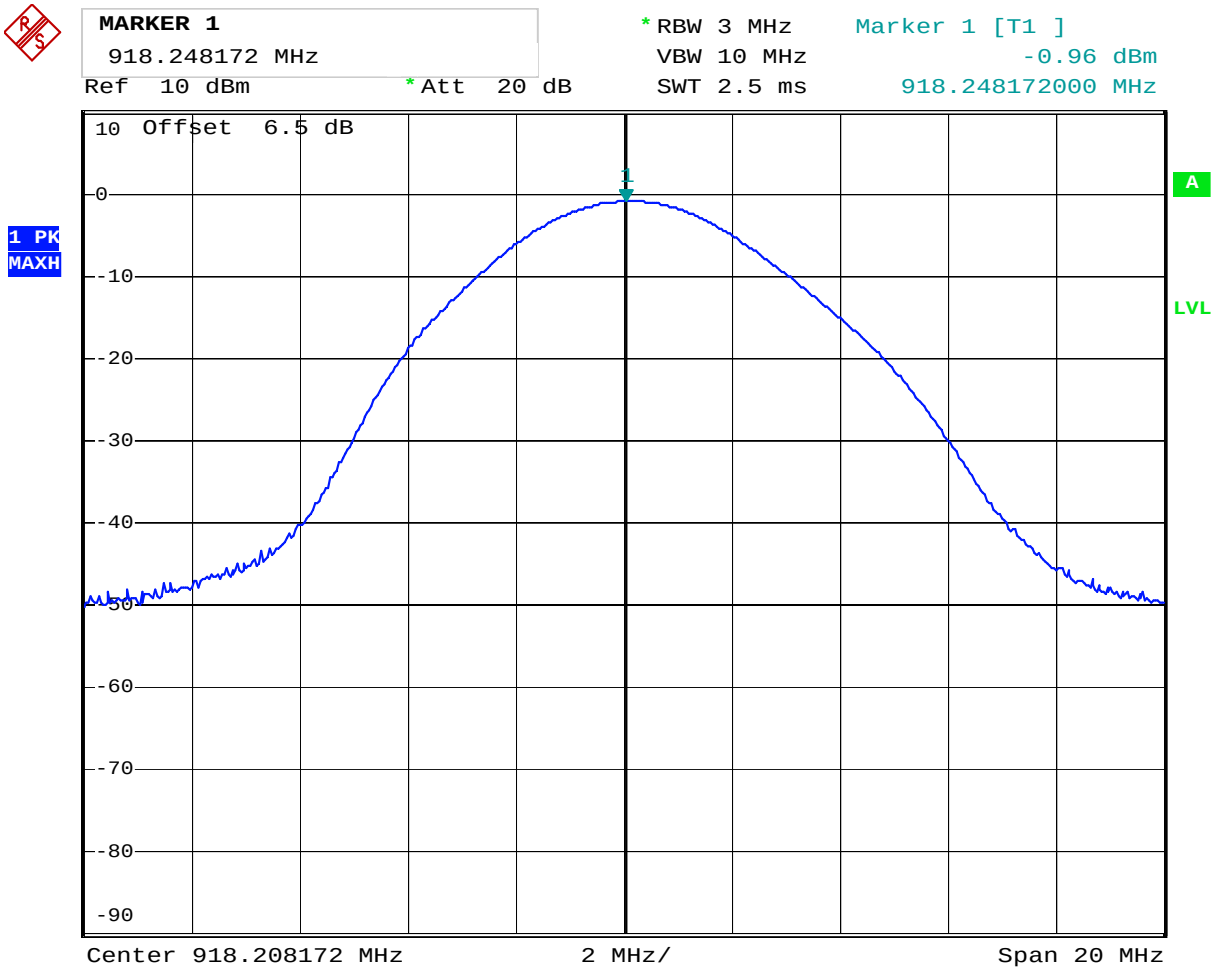
Radiated power is calculated from measured field strength by the formulas in KDB 412172 D01 Determining ERP and EIRP v01.

Detachable antenna?	☐ Yes	☒ No
If detachable, is the antenna connector non-standard?	☐ Yes	☐ No

SMA connector

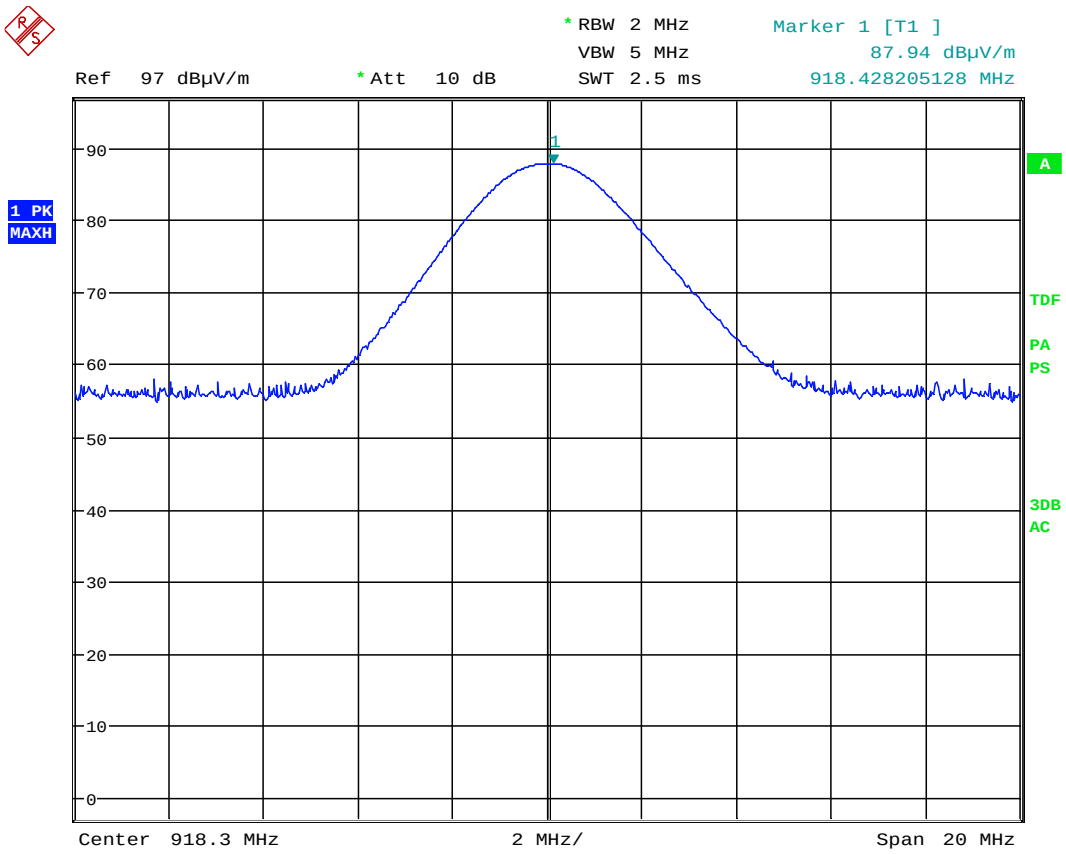
Requirements:

The maximum field strength shall be less than or equal to 94dBµV/m



Date: 7.SEP.2012 14:55:12

Conducted power – 918.3 MHz



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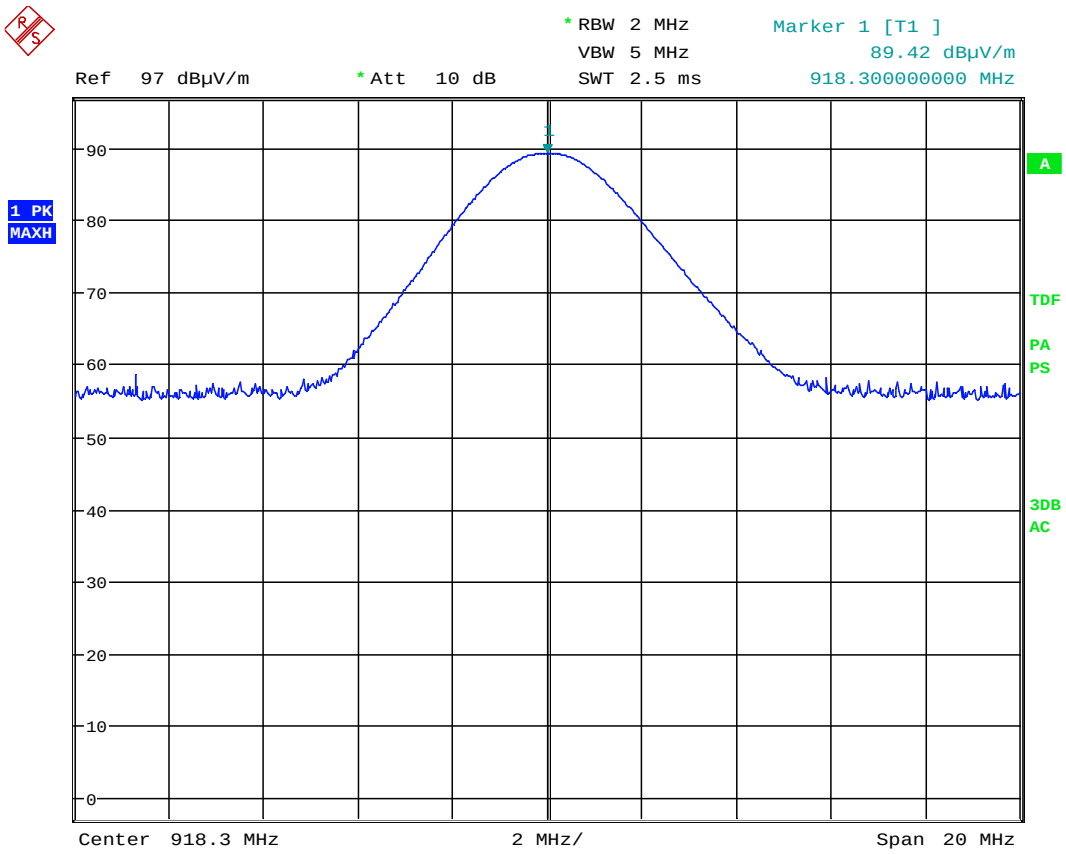
VP: 918.3 MHz – Field strength



Date: 7.SEP.2012 09:44:56

HP: 918.3 MHz – Field strength

4.3 Power Line Conducted Emission

Para. No.: 15.207 (c)

Test Performed By: T.Danglé	**Date of Test: 07-Sept-2012**

Test Results: Complies

Measurement Data:

See the attached graphs and tabells below.

Conducted limits: § 15.207 (a)

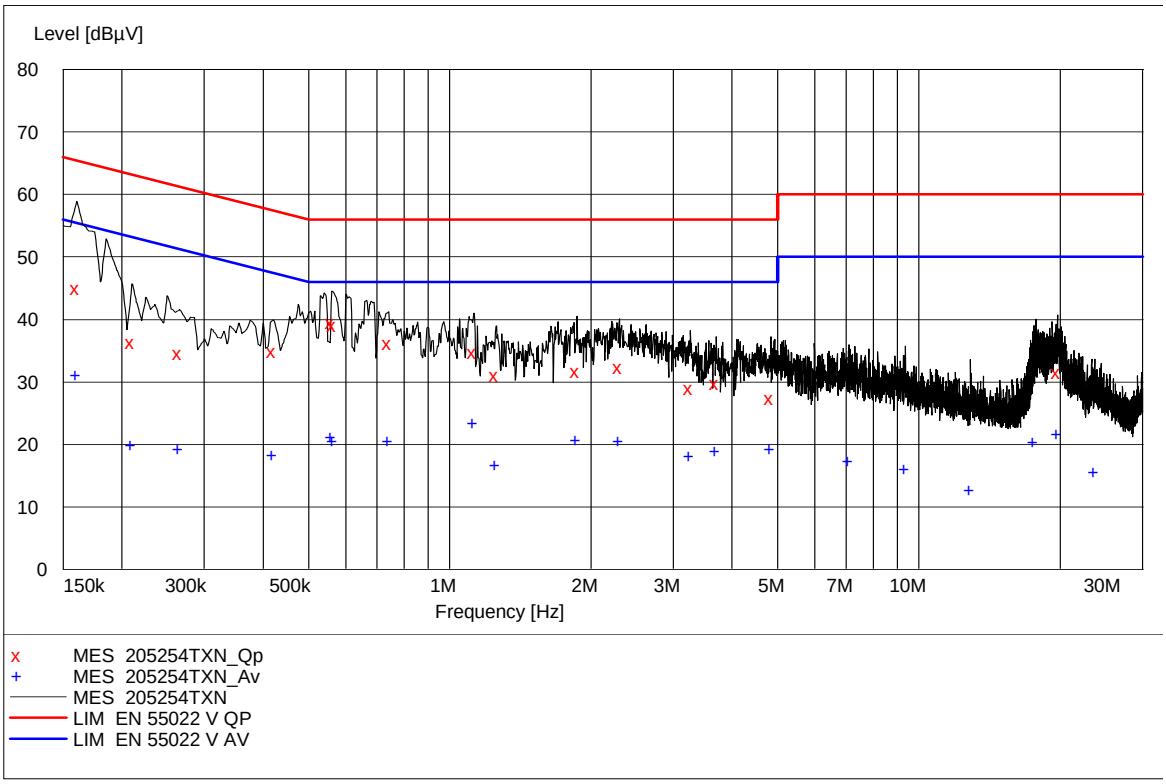
Frequency of emission (MHz)	**Conducted limits (dBµV)**	
	Quasi-peak	**Average**
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency.

The EUT was tested with a laptop PC from DELL. Model: Dell Precision M4300. ID-no. CN-0UY141-48643-86B-0736 and AC/DC power adapter CN-0MM545-48661-84J-8EG7.

Requirements:

Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.



Power Line Conducted Emission – 150 kHz – 30 MHz

With Quasi-peak detector:

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
0.160000	45.00	10.10	65.50	20.50	QP	L1	Pass
0.210000	36.40	10.10	63.20	26.80	QP	N	Pass
0.265000	34.70	10.10	61.30	26.60	QP	N	Pass
0.420000	34.90	10.20	57.40	22.50	QP	N	Pass
0.560000	39.50	10.20	56.00	16.50	QP	N	Pass
0.565000	39.10	10.20	56.00	16.90	QP	N	Pass
0.740000	36.20	10.20	56.00	19.80	QP	N	Pass
1.125000	34.80	10.20	56.00	21.20	QP	L1	Pass
1.255000	31.10	10.20	56.00	24.90	QP	N	Pass
1.870000	31.80	10.20	56.00	24.20	QP	N	Pass
2.300000	32.30	10.30	56.00	23.70	QP	N	Pass
3.260000	29.00	10.30	56.00	27.00	QP	L1	Pass
3.705000	29.80	10.30	56.00	26.20	QP	L1	Pass
4.835000	27.40	10.40	56.00	28.60	QP	N	Pass
19.825000	31.50	11.20	60.00	28.50	QP	N	Pass

With average detector:

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
0.160000	31.10	10.10	55.50	24.40	AV	L1	Pass
0.210000	19.90	10.10	53.20	33.30	AV	N	Pass
0.265000	19.30	10.10	51.30	32.00	AV	N	Pass
0.420000	18.30	10.20	47.40	29.10	AV	N	Pass
0.560000	21.20	10.20	46.00	24.80	AV	N	Pass
0.565000	20.60	10.20	46.00	25.40	AV	N	Pass
0.740000	20.60	10.20	46.00	25.40	AV	N	Pass
1.125000	23.40	10.20	46.00	22.60	AV	L1	Pass
1.255000	16.70	10.20	46.00	29.30	AV	N	Pass
1.870000	20.80	10.20	46.00	25.20	AV	N	Pass
2.300000	20.50	10.30	46.00	25.50	AV	N	Pass
3.260000	18.20	10.30	46.00	27.80	AV	L1	Pass
3.705000	18.90	10.30	46.00	27.10	AV	L1	Pass
4.835000	19.20	10.40	46.00	26.80	AV	N	Pass
7.100000	17.40	10.50	50.00	32.60	AV	N	Pass
9.365000	16.10	10.60	50.00	33.90	AV	L1	Pass
12.870000	12.60	10.70	50.00	37.40	AV	N	Pass
17.640000	20.40	11.00	50.00	29.60	AV	N	Pass
19.825000	21.60	11.20	50.00	28.40	AV	N	Pass
23.775000	15.50	11.30	50.00	34.50	AV	L1	Pass

4.4 Spurious Emissions (Radiated)

Para. No.: 15.249 (e)

Test Performed By: T.Danglé	**Date of Test: 07-Sept-2012**

Test Results: Complies

Measurement Data:

Tested item's transmission is with 100% duty cycle

Requirements:

As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Radiated Emissions, 1-10 GHz

1-10 GHz measured at a distance of 3m.

Measured with Peak Detector

Frequency	Dist. corr. factor	Field strength, Peak	Duty cycle corr. factor	Limit	Margin
GHz	dB	dBµV/m	dB	dBµV/m	dB
1 - 10	0	Non detected	-	74	-

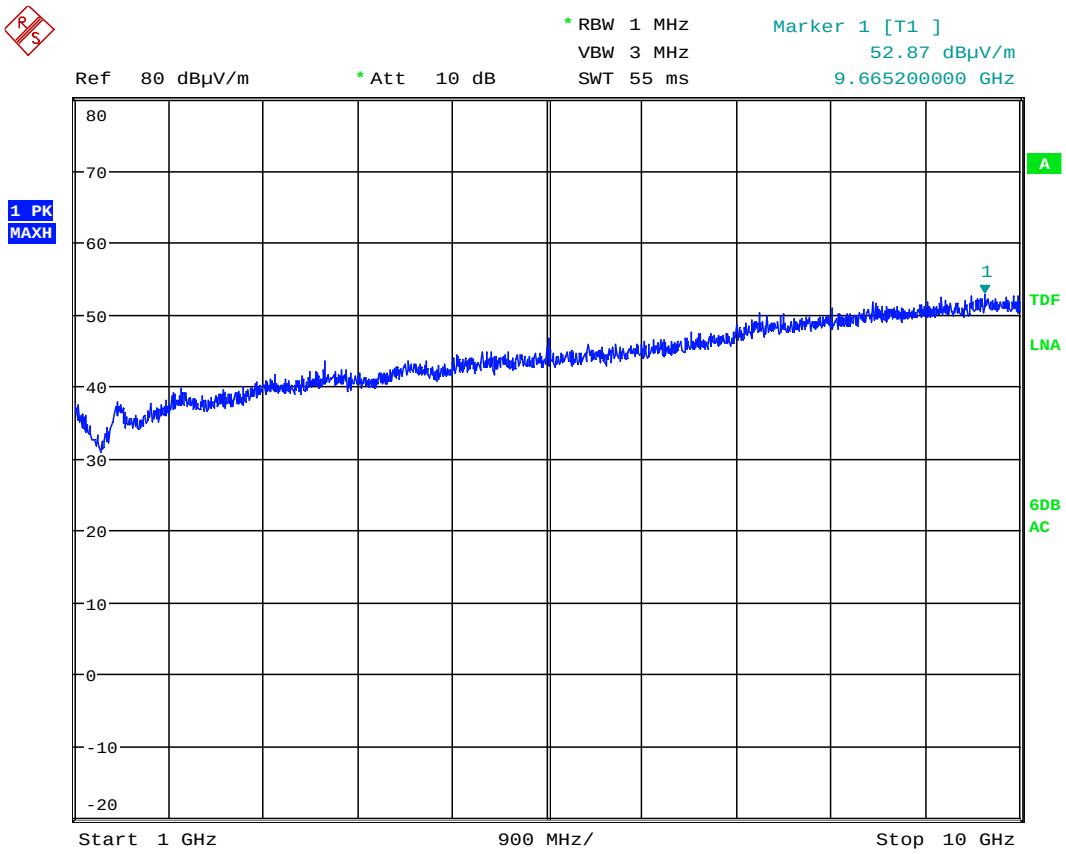
Radiated emissions,1- 10 GHz, Average Detector

Frequency	Dist. corr. factor	Field strength, RMS	Duty cycle corr. factor	Limit	Margin
GHz	dB	dBµV/m	dB	dBµV/m	dB
1 - 10	0	Non detected	-	54	-

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

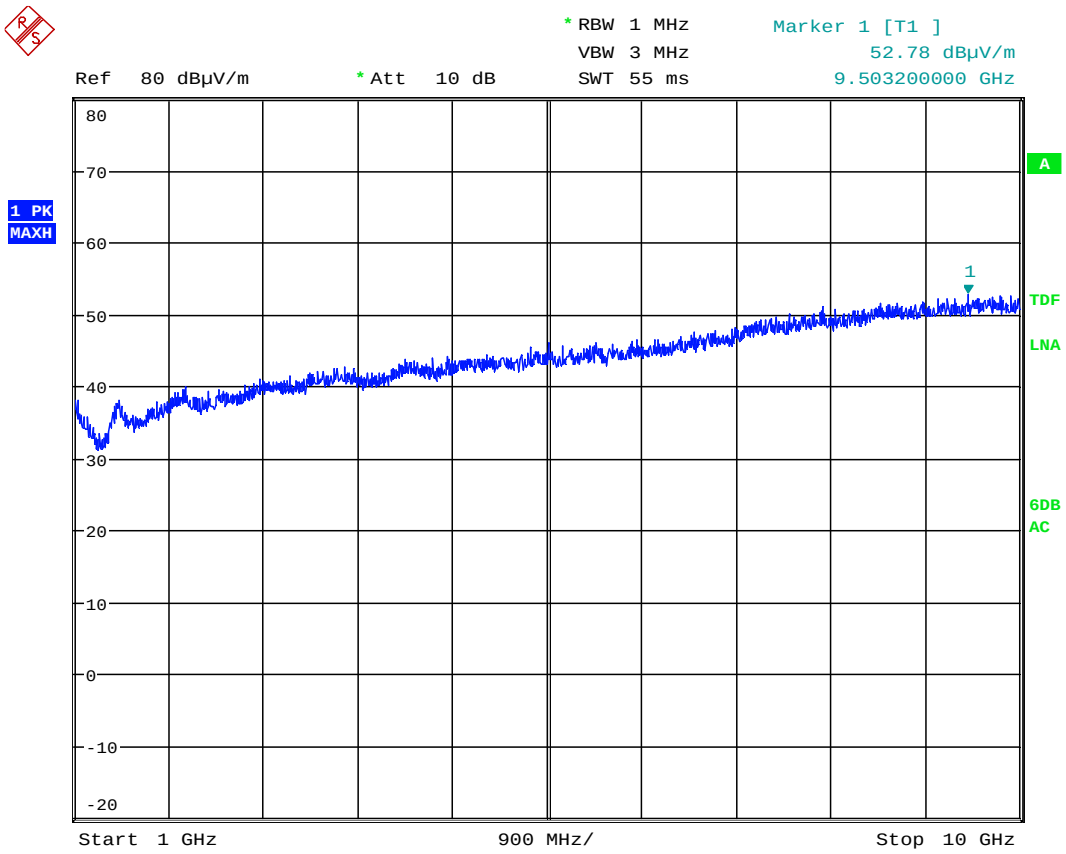
Requirement:

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.



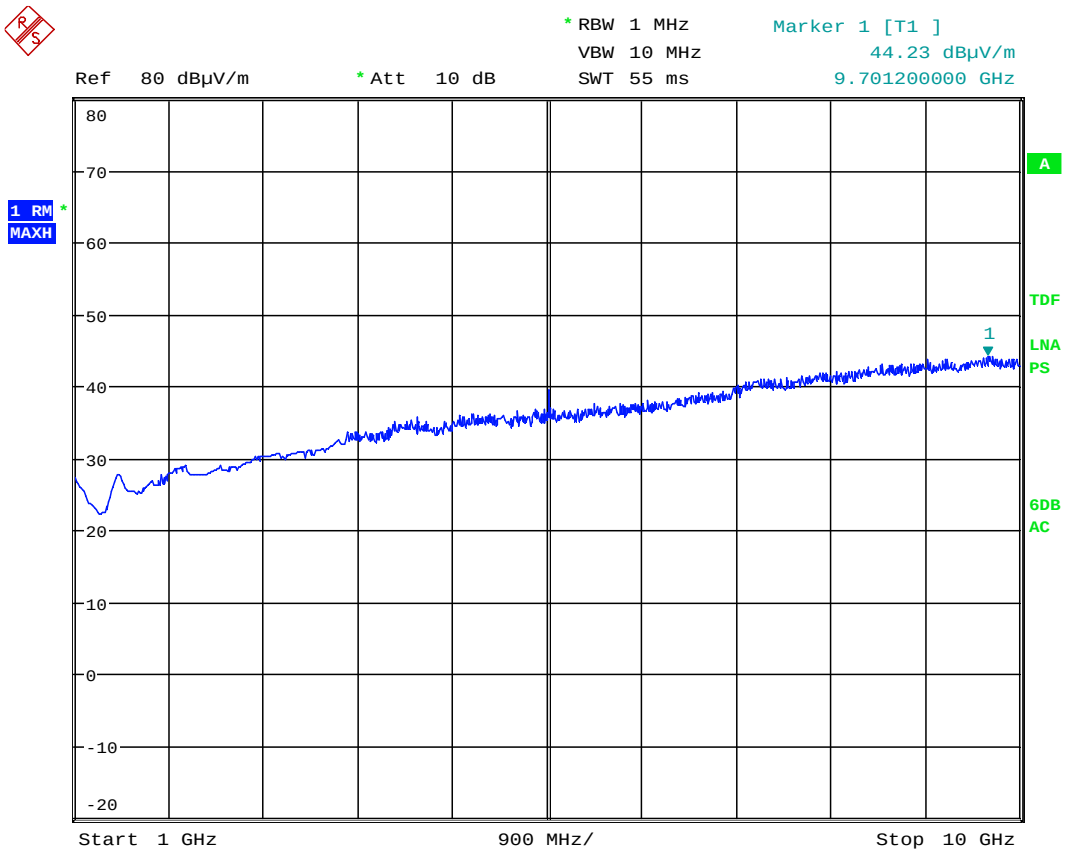
Date: 7.SEP.2012 12:35:40

VP: pre-scan 1 - 10 GHz – Peak detector with HP-filter



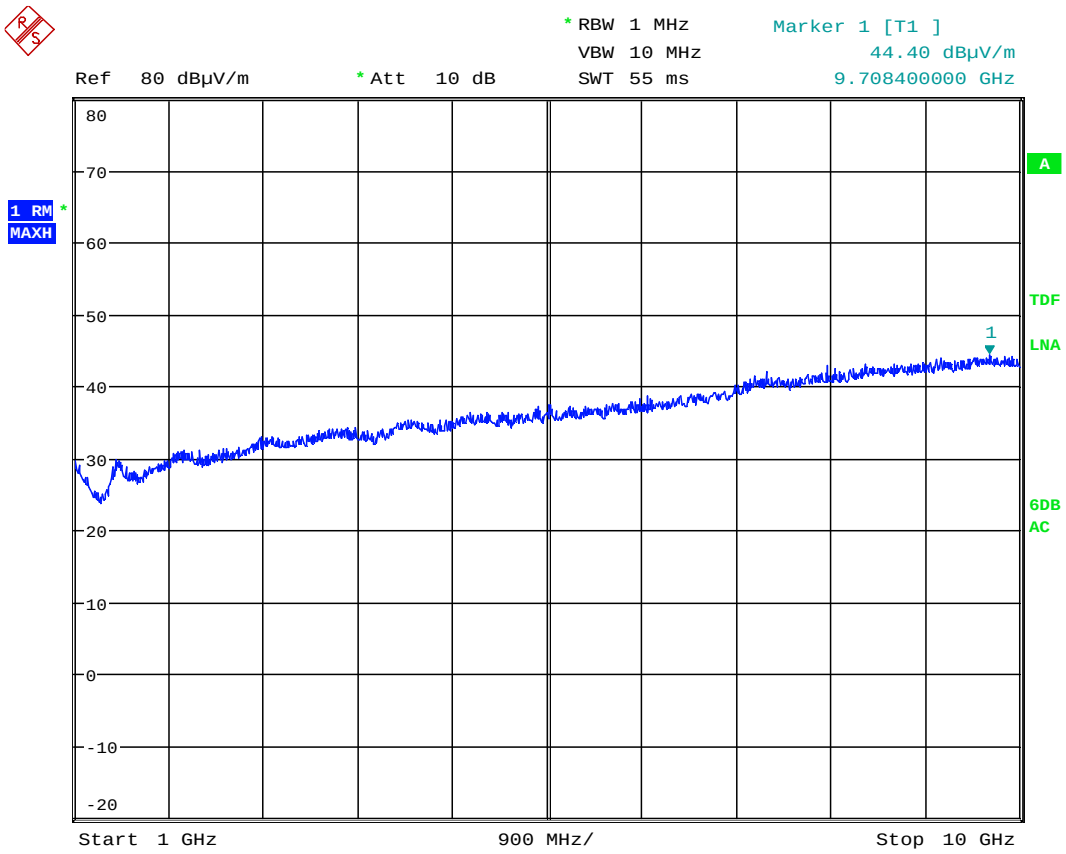
Date: 7.SEP.2012 12:38:31

HP: pre-scan 1 - 10 GHz – Peak detector with HP-filter



Date: 7.SEP.2012 12:33:12

VP: pre-scan 1 - 10 GHz – RMS detector with HP-filter



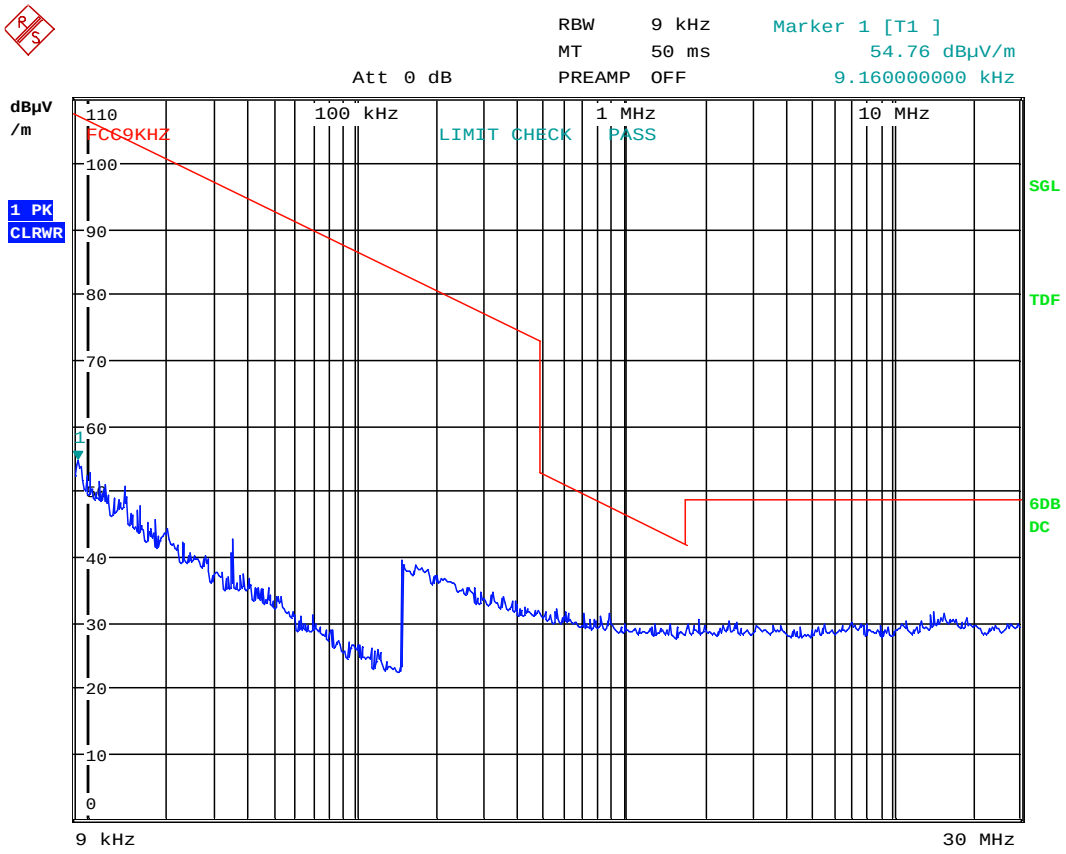
Date: 7.SEP.2012 12:41:01

HP: pre-scan 1 - 10 GHz – RMS detector with HP-filter

Radiated emissions 9kHz – 30 MHz.

Detector: Peak

Measuring distance 10 m.



Date: 7.SEP.2012 14:11:43

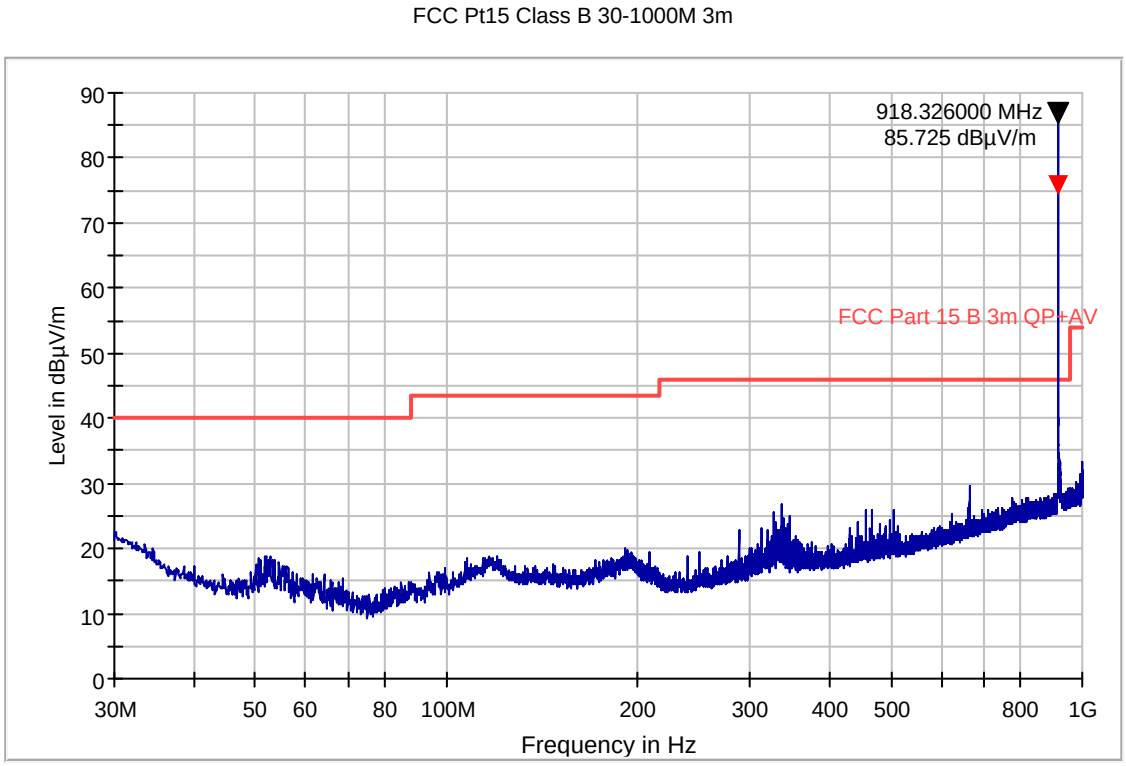
Radiated emissions 9kHz – 30 MHz.

Radiated emissions 30 – 1000 MHz.

Detector: Peak

Measuring distance 3 m.

The graph shows peak scan and highest values. The QP values are given in the table below.



FCC Pt15 Class B 30 – 1000 MHz 3m

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Comment
918.381024	76.0	1000.0	120.000	100.0	V	49.0	1.9	

This is the transmitter frequency on 918.3 MHz.

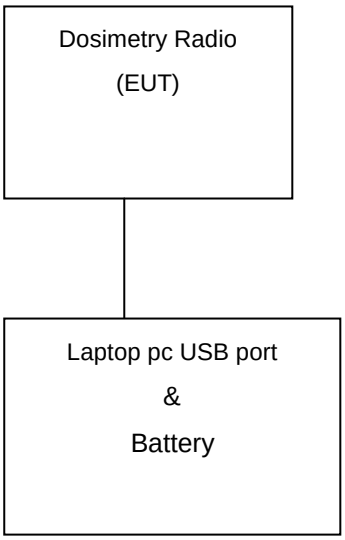
5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1.	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2010.06	2013.06
2.	3115	Antenna horn	EMCO	LR 1330	2010.08.05	2013.08.05
3.	FA147A101002020	Cable microwave	Rosenberger	LR 1360	Calb4 use	-
4.	6810.17A	Attenuator	Suhner	LR 1185	2011.10.18	2013.10.18
5.	87V	Multimeter, Digital	Fluke	LR1599	2010.12.15	2012.12.15
6.	8449B	Amplifier	Hewlett Packard	LR 1322	2011.09.26	2012.09.26
7.	HFH2-Z2	Antenna loop	Rohde and Schwarz	LR 285	2010.10.08	2013.10.08
8.	10855A	Amplifier	Hewlett Packard	LR 1445	2011.10.12	2012.10.12
9.	HL223	Antenna log.per	Rohde & Schwarz	LR 1261	2010.05.09	2013.05.09
10.	HK116	Antenna biconic	Rohde & Schwarz	LR 1260	2010.05.09	2013.05.09
11.	LNA6900	Amplifier, low noise	Teseq	LR1593	2011.11.24	2013.11.24
12.	JB3	Antenna Bilog	Sunol Sceiences	N4525	2010.09	2012.09
13.	FSP30	Spectrum Analyzer	Rohde & Schwarz	LR1551	2012.04.05	2013.04.05
14.	6HC 1500-18000	HP Filter	Trithlic	LR1612	Calb4 use	-

6 BLOCK DIAGRAM

6.1 System set up for radiated measurements



Test equipment: 1- 14

6.2 Test Site Radiated Emission