



Date 2007-03-26

Reference F620190R-F95 Page 1 (1)



Handled by, department
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PELTOR AB Lars Carlborg Malmstensgatan 19 331 02 VÄRNAMO

Equipment Authorization measurements on FRS/GMRS/BRS Transceiver Unit with FCC ID: NUVMT534720 and IC: 4406A-MT534720

(8 appendices)

Test object

Peltor PowerComplus II.

Three different test objects were used during the test.

EUT 1 marked with "P525 CS4-1 00073".

EUT 2 marked with "P525 CS4-1 00074".

EUT 3 marked with "P525 CS4-1 00150".

See appendix 1 for general information and appendix 8 for photos.

Summary

Standard	Compliant	Appendix	Remarks
FCC CFR 47	Yes		
2.1046 RF Power output	Yes	2	
2.1047 Modulation characteristics	Yes	3	
2.1049 Occupied bandwidth	Yes	4	
2.1053 Field strength of spurious radiation	Yes	5	
Receiver spurious emission (BRS)	Yes	6	
2.1055 Frequency stability	Yes	7	Note 1

Note 1: To fulfil the frequency stability measurements the EUT was adjusted by the software before the test.

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FCC ID: NUVMT534720 Appendix 1

IC: 4406A-MT534720

Test object-Technical description

Description - Equipment Under Test (EUT)

Equipment: FRS/GMRS/BRS Transceiver

<u>FRS</u>

Tx Frequency range: 462.5625 – 467.7125 MHz

Emission type: F3E Emission bandwidth: 12.5 kHz

<u>GMRS</u>

Tx Frequency range: 462.55 – 467.725 MHz

Emission type: F3E Emission bandwidth: 12.5 kHz

BRS

Tx Frequency range: 450 – 470 MHz

Emission type: F3E

Emission bandwidth: 12.5 and 25 kHz

Tested Channels:

B 450 MHz (BRS) M 462.5625 MHz (FRS) T 467.725 MHz (GMRS)

The tested object represents a worst case configuration.

The manufacturer supplied the following art no. MT53H7A4720.

The EUT had the following settings during the tests:

Surround off Volume 4 Vox 3 Squelch off Subchannel off

The power mode was set to high power, which was deemed to be the worst case.

The permanent internal antenna connector was used in some measurements.

During the measurements in extreme condition the s/w P525 Engineering Software, build date 2006-09-06, was used to control the EUT.

Manufacturer's representative:

Technical Lars Carlborg, Technical Project Manager, Peltor AB

(By audits prime contactee is Henrik Nordin, Peltor AB)

Certification Bryan Myers

Purpose of test

The purpose of the tests is to verify compliance with the performance characteristics specified in FCC CFR47.

Reservation

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in the report.

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Appendix 1

Delivery of test object

The test object was delivered: 2006-10-19, 2006-10-27 and 2006-11-13.

Test participant

Anders Hägglund, O-NETWORK ENGINEERING AB (partly present).

Test engineer

Fredrik Isaksson

Appendix 2

RF Power output measurements according to 47CFR 2.1046

Date	Temperature	Humidity
2006-10-19	22 °C ± 3 °C	41 % ± 5 %

Test set-up and procedure

The measurements were made per 47CFR 95.639.

EUT 2 marked with "P525 CS4-1 00074" was used during the test.

The test was performed without modulation.

The Effective Radiated Power (ERP) measurements were made in a fully anechoic chamber with the EMI Test Receiver. Substitution measurement according to TIA-603-C was performed. Measurements were done at 3 m distance.

The used test equipment was connected to an external 10 MHz reference standard during measurements.

Measurement equipment	Calibration Due	SP number
Anechoic chamber, Hertz	-	15:116
R&S EMI Test Receiver ESI40	2007-08	503 125
Chase bilog antennaCBL 6121A	2007-05	502 460
Schwarzbeck Precision dipole UHAP	2007-07	500 592
R&S Signal generator SMHU	2007-06	503 254
Artificial head	-	503 538
Testo 610 Temperature and humidity meter	2006-12	502 658

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Appendix 2

The test set-up during the RF power output (ERP) measurements can be seen in the picture below.



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Results

Test conditions		Effective Radiated Power (dBm) Peak detector		
		450 MHz 462.5625 MHz 467.725 MHz (BRS) (FRS) (GMRS)		467.725 MHz (GMRS)
T _{nom} 22°C	V _{nom} 3.0 V DC	19.0	18.9	18.5
Measurement	uncertainty	3.2 dB		

Limit

BRS:

According to 47CFR 90.205(h), the maximum allowable station ERP should be in accordance with table 2. According to 47CFR 90.217, transmitters which have an output power not exceeding 120 mW (20.8 dBm) ERP are exempted from the technical requirements set out in this subpart, but must instead comply with the requirements in 90.217.

FRS:

According to 47CFR 95.639(d), no FRS unit shall exceed 0.5 W (27 dBm) ERP.

GMRS:

According to 47CFR 95.135(c), a small control station must transmit with no more than 5 W (37 dBm).

Complies? Yes

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Appendix 3

Modulation characteristics measurements according to 47CFR 2.1047

Date	Temperature	Humidity
2006-11-15	22 °C ± 3 °C	33 % ± 5 %
2006-11-23	23 °C ± 3 °C	27 % ± 5 %

Test set-up and procedure

The measurements were made per 47CFR 95.637 and TIA-603-C.

EUT 3 marked with "P525 CS4-1 00150" was used during the test.

The permanent internal antenna connector was used during the measurement.

The test was performed for the FRS and GMRS frequencies, there are no requirements for BRS

The used test equipment was connected to an external 10 MHz reference standard during measurements.

Measurement equipment	Calibration Due	SP number
R&S CMTA 54 Radiocommunication analyser	2007-07	502 173
HP 3562A HP Dynamic Signal Analyzer	2007-10	501 915
Fluke 83 DMM	2006-11	501 521
HP DC power supply E3632A	-	503 170
Otronix DC power supply b502d	-	502 508
Testo 610 Temperature and humidity meter	2006-12	502 658

Measurement uncertainty: 3 %+6 Hz

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Appendix 3

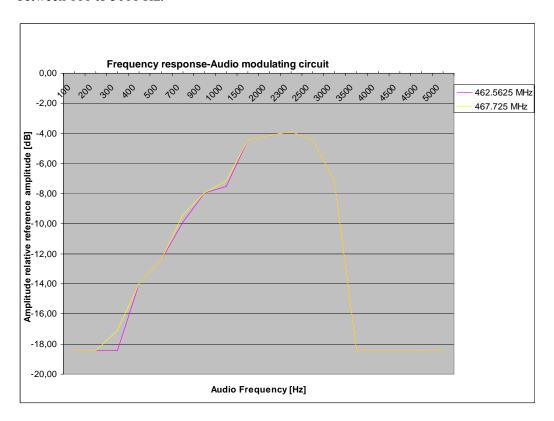
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Results

Audio frequency response:

Constant Input Test Method according to TIA-603-C was used. The audio frequency was varied between 100 to 5000 Hz.



Limits

According to 47CFR 95.637(a), a FRS unit the audio frequency response must not exceed 3.125 kHz.

Complies?	Yes
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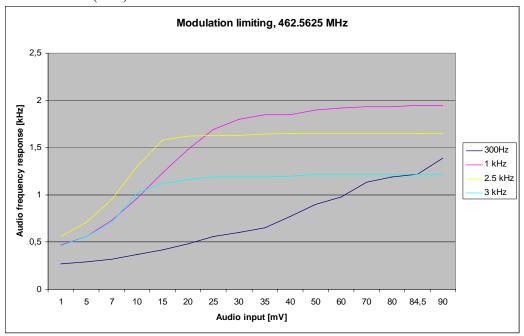
Appendix 3

Modulating limiting:

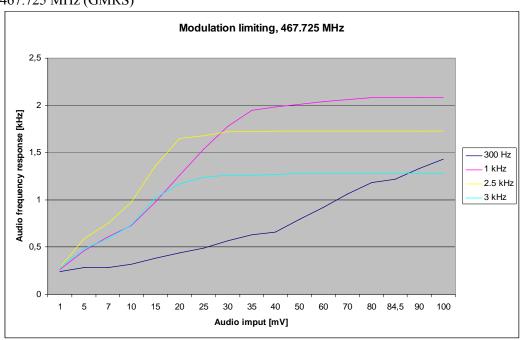
The test was performed according to 2.1047(b) with the test set-up according to TIA-603-C.

The audio frequency was varied between 300 Hz to 3000 Hz.

462.5625 MHz (FRS)



467.725 MHz (GMRS)



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Appendix 3

Limits

According to 47CFR 95.637(a):

- A GMRS transmitter must not exceed a peak frequency deviation of plus or minus 5 kHz
- A FRS unit must not exceed a peak deviation of plus or minus 2.5 kHz.

Complies?	Yes
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Appendix 3

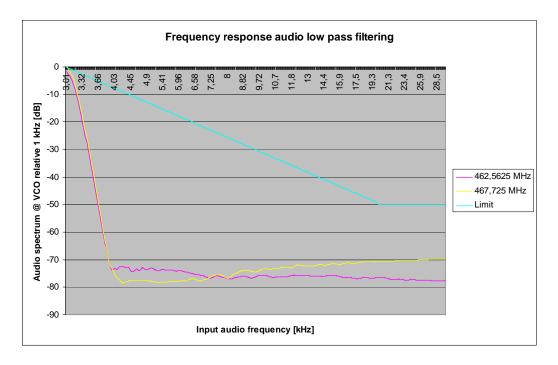
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Audio frequency low pass filtering:

Audio low pass filter response according to TIA-603-C was used. The audio frequency was varied between 3 to 30 kHz.

The get the signal to the audio spectrum analyzer according to clause c) a wire was connected to resistor R304.



Limits

According to 47CFR 95.637(b), at any frequency (f in kHz) between 3 and 20 kHz, the filter must have an attenuation of at least 60 log (f/3) dB greater than the attenuation at 1 kHz. Above 20 kHz, it must have an attenuation of at least 50 dB greater than the attenuation at 1 kHz.

Complies?	Yes	
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Appendix 4

Occupied bandwidth measurements according to 47CFR 2.1049

Date	Temperature	Humidity
2006-11-16	22 °C ± 3 °C	42 % ± 5 %

Test set-up and procedure

The measurements were made per 47CFR 95.635 and TIA-603-C.

EUT 3 marked with "P525 CS4-1 00150" was used during the test.

The permanent internal antenna connector was used during measurement.

The used test equipment was connected to an external 10 MHz reference standard during measurements.

Necessary bandwidth calculations (according to 2.202(b)):

BRS

Bn=2M+2DK, K=1

Emission bandwidth 12.5 kHz, M=3 kHz

D=2.5 kHz \rightarrow Bn=11 kHz

Emission designator=11K0F3E

Emission bandwidth 25 kHz, M=3 kHz

D=5 kHz \rightarrow Bn=16 kHz

Emission designator=16K0F3E

FRS

Bn=2M+2DK, K=1

M=3 kHz

D=2.5 kHz \rightarrow Bn=11 kHz

Emission designator=11K0F3E

GMRS

Bn=2M+2DK, K=1

M=3 kHz

D=2.5 kHz \rightarrow Bn=11 kHz

Emission designator=11K0F3E

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2007-08	502 738
R&S CMTA 54 Radiocommunication analyser	2007-07	502 173
Fluke 83 DMM	2006-11	501 521
Inmet attenuator 2069-20dB	2008-07	502 985
HP DC power supply E3632A	=	503 170
Testo 610 Temperature and humidity meter	2006-12	502 658

Measurement uncertainty: 2.9 dB

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Appendix 4

Results

The diagrams can be found in the diagrams beneath.

Diagram 1	450 MHz (BRS)	25 kHz channel bandwidth: Reference level, unmodulated carrier.
Diagram 2	450 MHz (BRS)	25 kHz channel bandwidth: Audio frequency=2.5 kHz, 16 dB greater than that necessary to produce 50% of rated system deviation (5 kHz).
Diagram 3	450 MHz (BRS)	25 kHz channel bandwidth: OBW=15.23 kHz
Diagram 4	450 MHz (BRS)	12.5 kHz channel bandwidth: Reference level, unmodulated carrier.
Diagram 5	450 MHz (BRS)	12.5 kHz channel bandwidth: Audio frequency=2.5 kHz, 16 dB greater than that necessary to produce 50% of rated system deviation (2.5 kHz).
Diagram 6	450 MHz (BRS)	12.5 kHz channel bandwidth: OBW=9.62 kHz
Diagram 7	462.5625 MHz (FRS)	Reference level, unmodulated carrier.
Diagram 8	462.5625 MHz (FRS)	Audio frequency=2.5 kHz, 16 dB greater than that necessary to produce 50% of rated system deviation (2.5 kHz).
Diagram 9	462.5625 MHz (FRS)	OBW=5.61 kHz
Diagram 10	467.725 MHz (GMRS)	Reference level, unmodulated carrier.
Diagram 11	467.725 MHz (GMRS)	Audio frequency=2.5 kHz, 16 dB greater than that necessary to produce 50% of rated system deviation (2.5 kHz).
Diagram 12	467.725 MHz (GMRS)	OBW=5.61 kHz

Limits

BRS: According to 47CFR 90.217(a)(b).

FRS/GMRS: According to 47CFR 95.635(1)(3)(7).

Complies? Yes

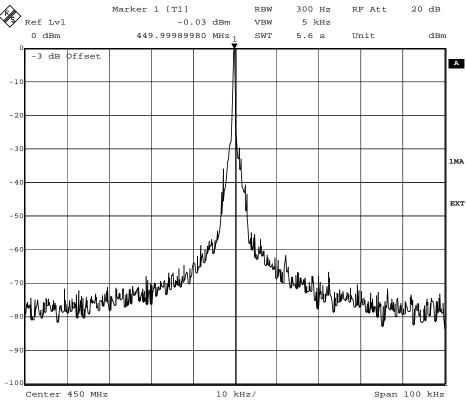
Date

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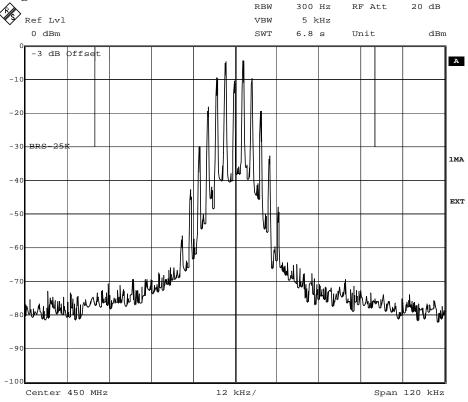
Appendix 4.1

Diagram 1



16.NOV.2006 11:05:21

Diagram 2



16.NOV.2006 11:15:57

Date

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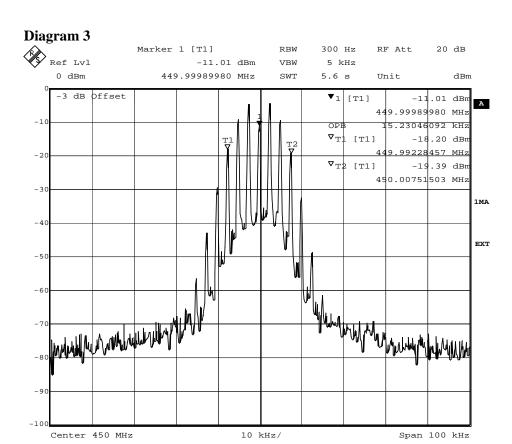
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16.NOV.2006 11:06:41

Date:

Appendix 4.1



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Appendix 4.1

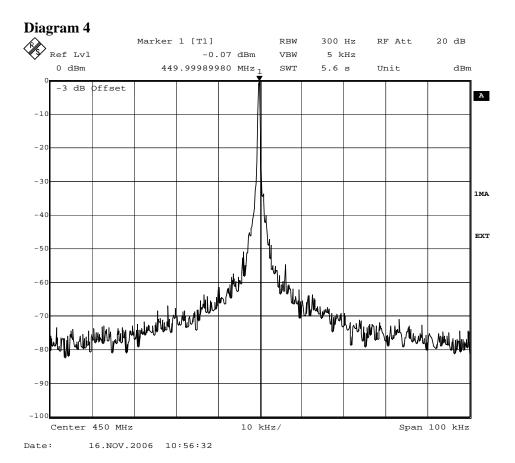
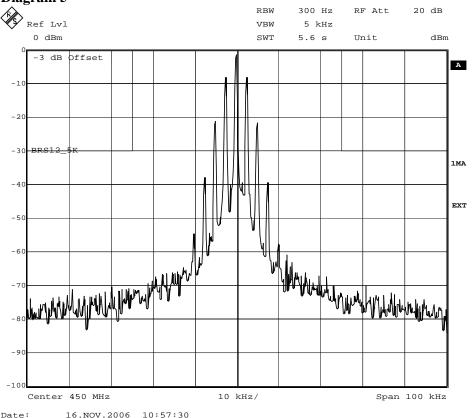


Diagram 5

Date:

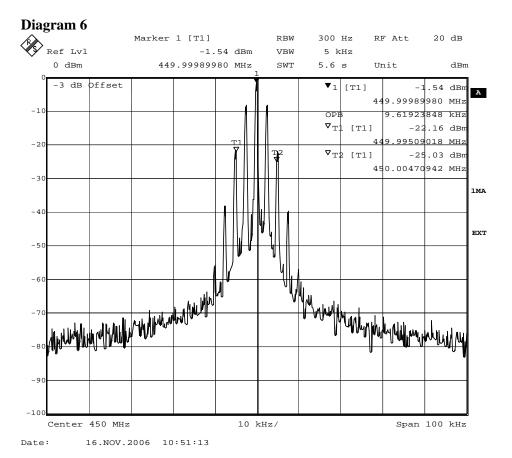


Date

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Appendix 4.1



Appendix 4.1

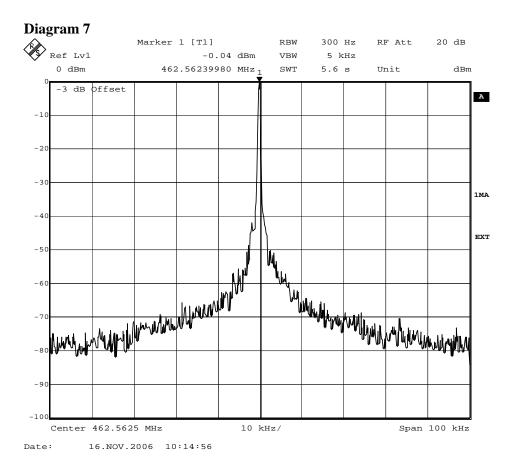
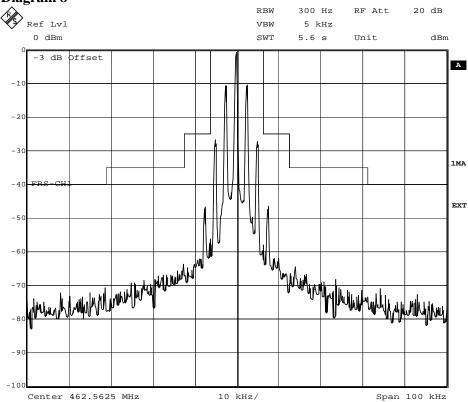
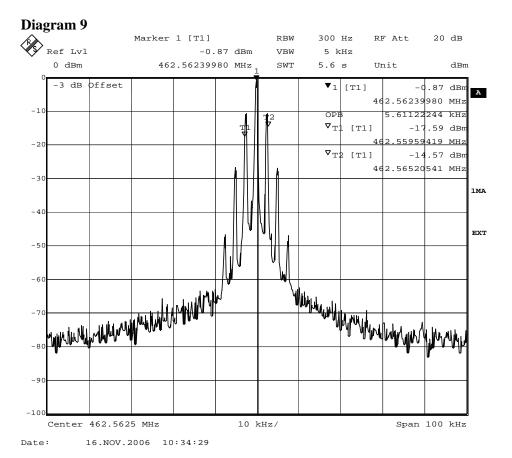


Diagram 8



Date: 16.NOV.2006 10:22:21

Appendix 4.1



Date

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Appendix 4.1

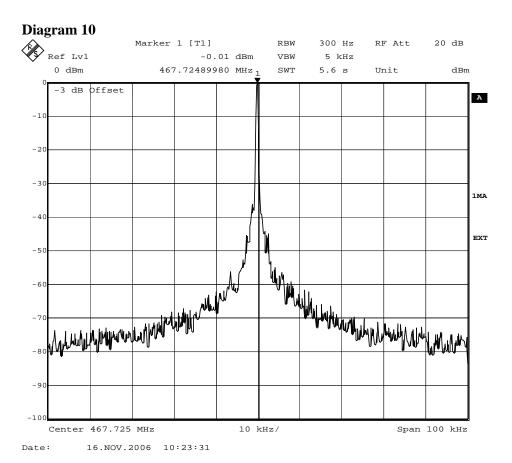
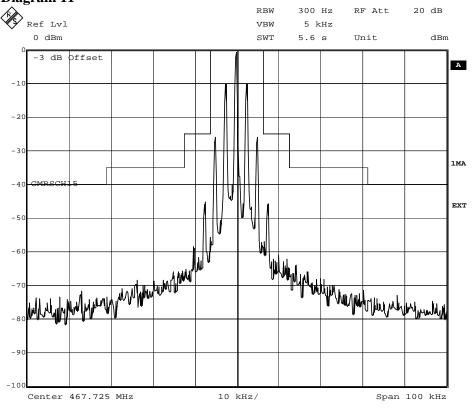
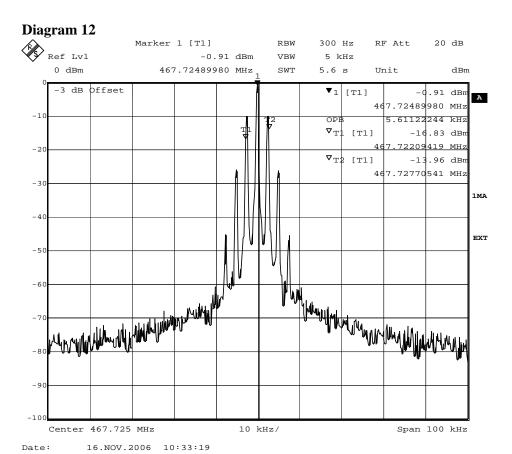


Diagram 11



16.NOV.2006 10:25:45 Date:

Appendix 4.1



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Field strength of spurious radiation measurements according to 47CFR 2.1053

Date	Temperature	Humidity
2006-10-20	23 °C ± 3 °C	42 % ± 5 %
2006-11-13	$22 ^{\circ}\text{C} \pm 3 ^{\circ}\text{C}$	23 % ± 5 %

Test set-up and procedure

The measurements were made per 47CFR 95.635.

EUT 2 marked with "P525 CS4-1 00074" was used during the test.

The EUT was powered by the standard battery.

The test was performed without modulation.

The field strength of spurious radiation measurements were made in a fully anechoic chamber. Substitution measurement according to TIA-603-C was performed.

The tests were performed both with and without the connection of the external interface cable, 1,5 m unshielded multi wire. Measurements were done at 3 m distance.

The used test equipment was connected to an external 10 MHz reference standard during measurements.

Analyser settings: 30-1000 MHz: RBW=30 kHz, VBW=300 kHz RBW=1 MHz, VBW= 3 MHz 1-5 GHz:

The measurements were performed in Effective Radiated Power (ERP). A fully anechoic chamber was used during the measurements. The chamber is regularly calibrated with the substitution method and from that calibration an ERP correction factor is derived. The correction factor was used as a transducer to get the readings in ERP.

The measurement procedure was as the following:

- 1. A pre-measurement was first performed with peak detector. The EUT was continuously measured in 360 degrees and with the antenna height at 1.55m.
- 2. Spurious radiation on frequencies closer than 6 dB to the limit was re-measured with the substitution method according to TIA-603-C.

Measurement equipment	Calibration Due	SP number
Anechoic chamber, Hertz	-	15:116
R&S EMI Test Receiver ESI40	2007-08	503 125
Chase bilog antennaCBL 6121A	2007-05	502 460
Chase bilog antenna CBL 6111A	2008-04	502 181
EMCO Horn Antenna 3115	2007-11	502 175
EMCO Horn Antenna 3115	2007-11	501 548
R&S Vector Network Analyzer ZVK	2007-06	503 687
Artificial head	-	503 538
Fluke 83 DMM	2006-11	501 521
Testo 610 Temperature and humidity meter	2006-12	502 658

The test set-up during the spurious radiation measurements can be seen in the pictures on page 2.

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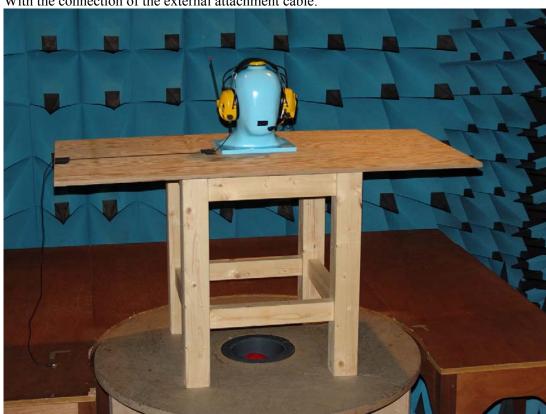
FCC ID: NUVMT534720 IC: 4406A-MT534720

Appendix 5

Without the connection of the external interface cable:



With the connection of the external attachment cable:



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Results

Without the connection of the external interface cable:

450 MHz (BRS):

	Spurious emission level (dBm) Peak detector	
Frequency (MHz)	Vertical	Horizontal
30-5 000	All emission > 20 dB below limit	All emission > 20 dB below limit
Measurement uncertainty		3.2 dB

462.5625 MHz (FRS):

	Spurious emission level (dBm) Peak detector	
Frequency (MHz)	Vertical	Horizontal
30-5 000	All emission > 20 dB below limit	All emission > 20 dB below limit
Measurement uncertainty		3.2 dB

467.725 MHz (GMRS):

	Spurious emission level (dBm) Peak detector	
Frequency (MHz)	Vertical	Horizontal
30-5 000	All emission > 20 dB below limit	All emission > 20 dB below limit
Measurement uncertainty		3.2 dB

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With the connection of the external interface cable:

450 MHz (BRS):

	Spurious emission level (dBm) Peak detector	
Frequency (MHz)	Vertical	Horizontal
30-5 000	All emission > 20 dB below limit	All emission > 20 dB below limit
Measurement uncertainty		3.2 dB

462.5625 MHz (FRS):

	Spurious emission level (dBm) Peak detector	
Frequency (MHz)	Vertical	Horizontal
30-5 000	All emission > 20 dB below limit	All emission > 20 dB below limit
Measurement uncertainty		3.2 dB

467.725 MHz (GMRS):

	Spurious emission level (dBm) Peak detector	
Frequency (MHz)	Vertical	Horizontal
30-5 000	All emission > 20 dB below limit	All emission > 20 dB below limit
Measurement uncertainty		3.2 dB

Limits

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB according to 47 CFR 95.635(7).

Complies?	Yes
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Appendix 6

Receiver spurious emission measurements according to RSS-119

Date	Temperature	Humidity
2006-11-22	21 °C ± 3 °C	32 % ± 5 %

Test facility

The used anechoic chamber (15:115) is compliant with the requirements of section 2.948 of the FCC rules and listed, registration number 96866, as a facility accepted for certification under parts 15 and 18. The site complies with RSS 212, Issue 1 and is accepted by Industry Canada for the performance of radiated measurements, file number IC 3482.

Test set-up and procedure

The measurements were made per RSS-Gen.

EUT 3 marked with "P525 CS4-1 00150" was used during the test.

The EUT was powered by the standard battery.

The tests were performed with the connection of the external interface cable, 1,5 m (total length) unshielded multi wire.

The radiated spurious emission measurements were performed in the semi-anechoic chamber. A pre-scan with an antenna height of 1, 1.5, and 2 m was performed with both horizontal and vertical polarization, the turntable was varied between 0-360 degrees. Spurious emission detected was scanned with antenna height 1-4 m for maximum response. The antenna distance during the measurements was 3 m.

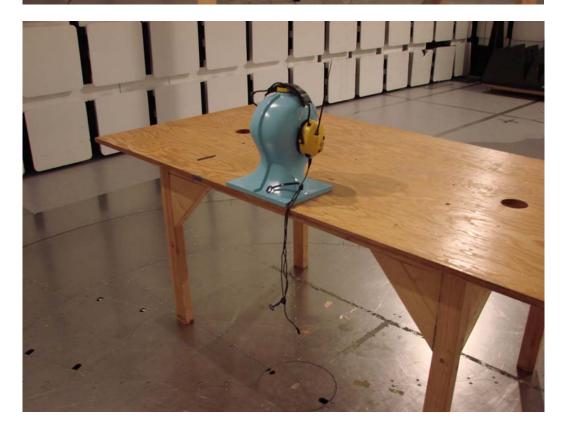
At emission levels closer than 10 dB to the limit, then the emission is measured with the quasipeak detector on frequencies below 1 GHz and with the average detector above 1 GHz.

Measurement equipment	Calibration Due	SP number
Semi anechoic chamber, Tesla	-	15:115
Spectrum analyzer R&S ESI 26	2007-09	503 292
Software: R&S ES-K1, ver. 1.60	-	503 423
Antenna Chase Bilog CBL 6111A	2008-11	503 182
Horn antenna EMCO 3115	2007-11	502 175
Preamplifier Miteq, 0.1-26 GHz	2007-08	503 285
Artificial head	-	503 538
Temperature and humidity meter Testo 615	2007-09	503 505

Appendix 6

The test set-up is shown below, with the connection of the external attachment cable:





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Appendix 6

Result

The emission spectra can be found in the diagrams beneath.

450 MHz (BRS):

Diagram 1: Radiated emission 30-1000 MHz vertical and horizontal polarizations. Diagram 2: Radiated emission 1-2 GHz vertical and horizontal polarizations.

462.5625 MHz (FRS):

Diagram 3: Radiated emission 30-1000 MHz vertical and horizontal polarizations. Diagram 4: Radiated emission 1-2 GHz vertical and horizontal polarizations.

467.725 MHz (GMRS):

Diagram 5: Radiated emission 30-1000 MHz vertical and horizontal polarizations. Diagram 6: Radiated emission 1-2 GHz vertical and horizontal polarizations.

Limits

According to RSS-Gen 6(a).

Table 1 – Spurious Emission Standard

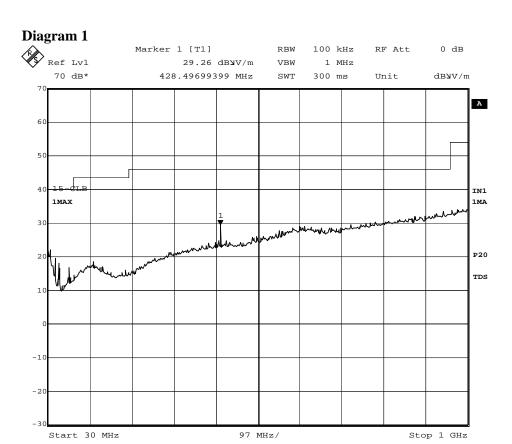
Spurious Frequency (MHz)	Field Strenght (dBuV/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Complies?	Yes
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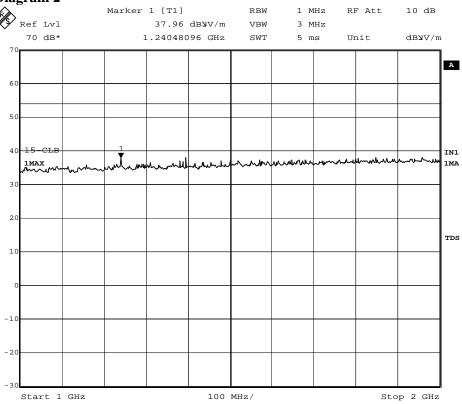
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Appendix 6.1



Date: 22.NOV.2006 09:58:48

Diagram 2



Date: 22.NOV.2006 11:19:11

Date

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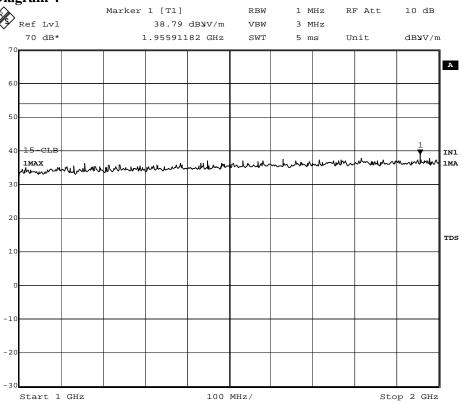
FCC ID: NUVMT534720 IC: 4406A-MT534720

Appendix 6.1

Diagram 3 Marker 1 [T1] 100 kHz 0 dB RBW RF Att 28.03 dBWV/m VBW 1 MHz 70 dB* 442.10420842 MHz SWT 300 ms Unit dB**y**V/m A IN1 1MAX 1MA P20 TDS 97 MHz/ Start 30 MHz Stop 1 GHz

22.NOV.2006 10:08:56 Date:

Diagram 4



22.NOV.2006 11:05:29 Date:

Appendix 6.1

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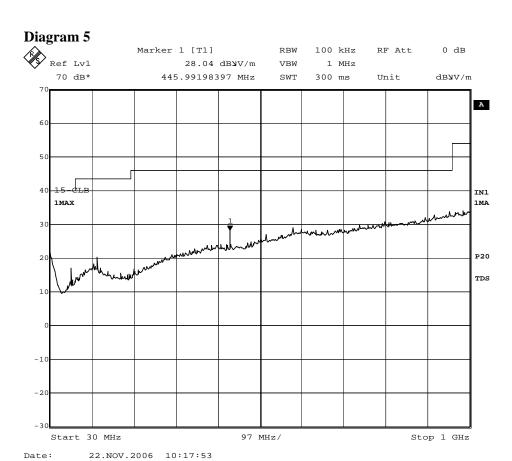
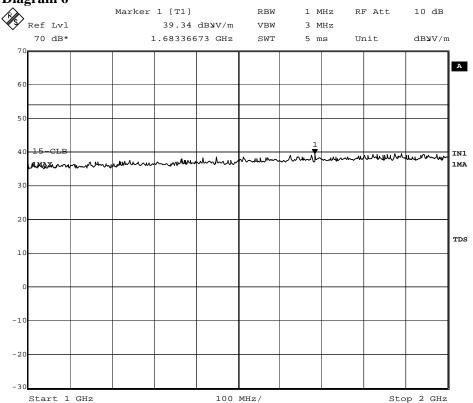


Diagram 6



22.NOV.2006 10:44:26

Appendix 7

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Frequency stability measurements according to 47CFR 2.1055

Date	Temperature	Humidity
2006-11-06	22 °C ± 3 °C	39 % ± 5 %
2006-11-07	22 °C ± 3 °C	36 % ± 5 %
2006-11-08	23 °C ± 3 °C	39 % ± 5 %

Test set-up and procedure

The measurements were made per 47CFR 95.627 and TIA-603-C.

EUT 1 marked with "P525 CS4-1 00073" was used during the test.

The test was performed without modulation.

The permanent internal antenna connector was used during measurement.

The used test equipment was connected to an external 10 MHz reference standard during measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2007-08	502 738
Fluke 83 DMM	2006-11	501 521
Inmet attenuator 2069-20dB	2008-07	502 985
HP DC power supply E3632A	-	503 170
Climate chamber	2008-11	500 082
Testo 610 Temperature and humidity meter	2006-12	502 658

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 $\begin{array}{c} \text{Reference} \\ F620190R\text{-}F95 \end{array}$

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Appendix 7

Results

Test conditions		Frequency error (kHz)		
Supply voltage DC (V)	T (°C)	450 MHz 12.5 kHz channel bandwidth (BRS)	462.5625 MHz (FRS)	467.725 MHz (GMRS)
3.45	+20	0.018	-0.082	-0.117
3.0	+20	0.042	-0.048	-0.133
2.55	+20	-0.032	-0.017	-0.181
2.0	+20	-0.040	-0.033	-0.090
3.0	+30	-0.383	-0.397	-0.402
3.0	+40	-0.529	-0.517	-0.527
3.0	+50	-0.484	-0.522	-0.536
3.0	+10	0.337	0.351	0.354
3.0	0	0.572	0.591	0.616
3.0	-10	0.880	0.918	0.970
3.0	-20	0.912	0.923	0.934
3.0	-30	0.801	0.829	0.840
Maximum freq. e	error (kHz)	0.912	0.923	0.970
Measurement uncertainty		$< \pm 1 \times 10^{-8}$		

Remark

At 2.0 V DC (the battery endpoint), the transmitter shut down after a few seconds. To fulfil the frequency stability measurements the EUT was adjusted by the software before the test. The frequency was adjusted with the command, *XO220*; in the terminal window.

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Appendix 7

Limits

BRS:

According to 47CFR 90.213(a), mobile station with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm (1.125 kHz).

According to 47CFR 90.217, transmitters which have an output power not exceeding 120 mW (20.8dBm) ERP are exempt from the technical requirements set out in this subpart, but must instead comply with the requirements in 90.217.

FRS:

According to 47CFR 95.627(b), each FRS unit must be maintained within a frequency tolerance of 0.00025% (1.156 kHz).

GMRS:

According to 47CFR 95.621(b), each GMRS transmitter for mobile station must be maintained within a frequency tolerance of 0.0005% (2.338 kHz).

Complies?	Yes
Compiles.	

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Appendix 8

Photos, s/n 00150



EUT, identity



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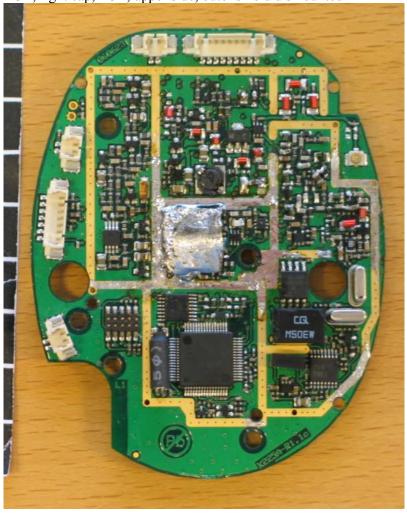
REPORT

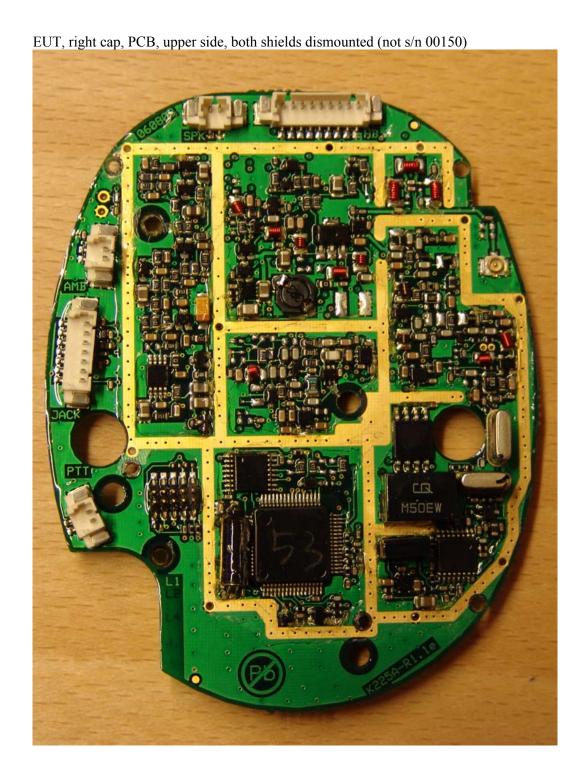
FCC ID: NUVMT534720 IC: 4406A-MT534720



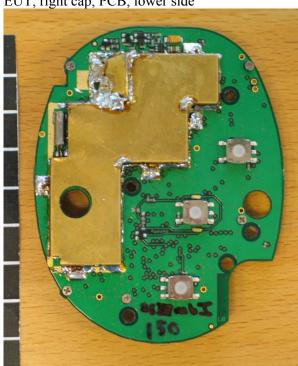












EUT, right cap, PCB, lower side, shield dismounted (not s/n 00150)

