


	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

DECLARATION OF COMPLIANCE - FCC PART 95(A/B) & IC RSS-210 (Issue 8)

Test Lab Information	Name	CELLTECH LABS INCORPORATED				
	Address	21-364 Lougheed Road, Kelowna, British Columbia V1X 7R8 Canada				
Test Lab Accreditation(s)	A2LA	ISO/IEC 17025:2005 (A2LA Test Lab Certificate No. 2470.01)				
Test Site Registration No.(s)	IC	3874A-1				
Applicant Information	Name	GARMIN INTERNATIONAL INC.				
	Address	1200, East 151 st Street, Olathe, KS, 66062 USA				
Standard(s) & Procedure(s)	FCC	47 CFR Part 2	47 CFR Part 95 Subpart A	47 CFR Part 95 Subpart B		
	IC	RSS-210 Issue 8		RSS-Gen Issue 3		
	ANSI	TIA/EIA-603-C-2004		C63.4-2003		
Device Classification(s)	FCC	Part 95 Family Radio Face Held Transmitter (FRF) - GMRS			47 CFR §95 (Subpart A)	
		Part 95 Family Radio Face Held Transmitter (FRF) - FRS			47 CFR §95 (Subpart B)	
	IC	Low-power Licence-exempt Radiocommunication Device (GMRS/FRS)			RSS-210 Issue 8	
Device Category	FCC/IC	Portable				
RF Exposure Category	FCC/IC	General Population / Uncontrolled				
Application Type	FCC	New Certification		IC:	New Certification	
Device Identifier(s)	FCC ID:	IPH-01767		IC:	1792A-01767	
Device Under Test (DUT)	Portable FM UHF FRS/GMRS Push-To-Talk (PTT) Radio Transceiver with GPS					
Date of Sample Receipt	April 15, 2011					
Date(s) of Evaluation	May 18, June 1-10, 2011					
Device Model(s)	Rino 650, Rino 655t (with camera)					
Test Sample Serial No.(s)	1766382247997103 (Identical Prototype) - Rino 655t					
Transmit Frequency Ranges	462.5500 - 462.7250 MHz (GMRS Channels 15-22)					
	462.5625 - 462.7125 MHz (GMRS/FRS Channels 1-7)					
	467.5625 - 467.7125 MHz (FRS Channels 8-14)					
Max. RF Output Power Tested	Mode	Frequency	Channel	dBm	Watts	Method
	GMRS	462.5625 MHz	1	33.0	2.0	ERP
	FRS	467.5625 MHz	8	22.0	0.160	ERP
Modulation Type(s)	FM					
Antenna Type(s) Tested	Helix (Non-detachable)	Gain: -1.8 dBi	Length : 62.3 mm		P/N: 700-00040-00	
Power Source(s) Tested	Lithium-ion Battery	7.8 V (Nominal)	2300 mAh		P/N: 011-02526-30	
<p>This wireless device has demonstrated compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC 47 CFR Rule Part 2, Part 95 Subpart A, Part 95 Subpart B; Industry Canada RSS-210 Issue 8, RSS-Gen Issue 3; ANSI TIA/EIA-603-C-2004 and ANSI C63.4-2003.</p> <p>I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.</p> <p>The results and statements contained in this report pertain only to the device(s) evaluated.</p> <p>This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc.</p>						
Test Report Approved By			Sean Johnston	Lab Manager	Celltech Labs Inc.	

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS	DUT Model(s):	Rino 650, Rino 655t			
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
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					Test Lab Certificate No. 2470.01

TABLE OF CONTENTS

1.0 SCOPE	5
2.0 REFERENCES	5
2.1 Normative References	5
3.0 PASS/FAIL CRITERIA	5
4.0 FACILITIES AND ACCREDITATIONS	6
5.0 GENERAL INFORMATION	6
5.1 Applicant Information	6
5.2 DUT Description	6
5.3 Rule Part(s) & Classification(s)	6
5.4 Mode(s) of Operation Tested	7
5.5 Modification(s)	7
6.0 ANTENNA REQUIREMENT (FCC §95.647).....	7
7.0 ANTENNA REQUIREMENT (RSS-210 A6.1.4).....	7
Appendix A RF Output Power Measurement.....	8
Appendix B Modulation Characteristics (Modulation Limiting)	11
Appendix C Modulation Characteristics (Audio Frequency Response).....	15
Appendix D Modulation Characteristics (Low-pass Filter Response)	17
Appendix E Occupied Bandwidth and Emission Mask.....	19
Appendix F Radiated Spurious Emissions - TX.....	29
Appendix G Radiated Spurious Emissions - RX	33
Appendix H Frequency Stability	36
END OF DOCUMENT	39


FIGURES




Figure A.5-1 - Setup Drawing – RF Output Power	9
Figure B.5-1 - Setup Drawing – Modulation Characteristics.....	11
Figure C.5-1 - Setup Drawing – Audio Frequency Response.....	15
Figure D.5-1 - Setup Drawing – Low-pass Filter Response	17
Figure E.5-1 - Setup Drawing – Occupied Bandwidth & Emission Mask	19
Figure F.6-1 - Setup Drawing – Radiated TX Spurious Emissions	30
Figure G.6-1 - Setup Drawing – Radiated RX Spurious Emissions	34
Figure H.5-1 - Setup Drawing – Frequency Stability	36

	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
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Test Lab Certificate No. 2470.01

TEST SUMMARY						
Referenced Standard(s):		FCC CFR Title 47 Parts 2, 95(A/B)				
Appendix	Description of Test	Procedure Reference	Limit Reference	Test Start	Test End	Result
A	Effective Radiated Power (ERP)	ANSI/TIA/EIA-603-C	\$95.639	May 18	May 18	Pass
B	Modulation Limiting	ANSI/TIA/EIA-603-C	\$2.1047, \$95.637	June 8	June 10	Pass
C	Audio Frequency Response	ANSI/TIA/EIA-603-C	\$2.1047	June 8	June 10	Pass
D	Low-Pass Filter Response	ANSI/TIA/EIA-603-C	\$2.1047, \$95.637	June 8	June 10	Pass
E	Occupied Bandwidth and Emission Mask	ANSI/TIA/EIA-603-C	\$2.1049, \$95.633, \$95.635	June 1	June 3	Pass
F	Radiated TX Spurious Emissions	ANSI/TIA/EIA-603-C	\$2.1053, \$95.635 (b) (7)	June 6	June 7	Pass
G	Radiated RX Spurious Emissions	n/a	n/a	June 6	June 7	n/a
H	Frequency Stability	ANSI/TIA/EIA-603-C	\$2.1055, \$95.621, \$95.627	June 8	June 8	Pass
Referenced Standard(s):		Industry Canada RSS-210 Issue 8; RSS-Gen Issue 3				
Appendix	Description of Test	Procedure Reference	Limit Reference	Test Start	Test End	Result
A	Effective Radiated Power (ERP)	ANSI/TIA/EIA-603-C	RSS-210 A6.1.4 RSS-210 A6.2.4	May 18	May 18	Pass
B	Modulation Limiting	ANSI/TIA/EIA-603-C	RSS-210 A6.1.2 RSS-210 A6.2.2	June 8	June 10	Pass
C	Audio Frequency Response	ANSI/TIA/EIA-603-C	N/A	June 8	June 10	Pass
D	Low-Pass Filter Response	ANSI/TIA/EIA-603-C	RSS-210 A6.2.2	June 8	June 10	Pass
E	Occupied Bandwidth and Emission Mask	RSS-Gen 4.6.1	RSS-210 A6.1.3, A6.2.3 A6.1.5, A6.2.5	June 8	June 10	Pass
F	Radiated TX Spurious Emissions	RSS-Gen 4.9	RSS-210 A6.1.5, A6.2.5	June 6	June 7	Pass
G	Radiated RX Spurious Emissions	RSS-Gen 4.10	RSS-Gen 6.(a)	June 6	June 7	Pass
H	Frequency Stability	RSS-Gen 4.7	RSS-210 A6.1.6 RSS-210 A6.2.6	June 8	June 8	Pass


Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	
					Test Lab Certificate No. 2470.01

REVISION LOG

Revision	Description	Implemented By	Implementation Date
1.0	Initial Release	Jon Hughes	July 15, 2011

Test Report Prepared By	Date	QA Review By	Date
Sean Johnston	July 14, 2011	Jon Hughes	July 15, 2011

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	
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					Test Lab Certificate No. 2470.01

1.0 SCOPE

This report outlines the measurements made and results collected during electromagnetic emissions testing of the Garmin International Inc. Rino 610 Portable GMRS/FRS Push-To-Talk Radio Transceiver (FCC ID: IPH-01767 / IC: 1792A-01767). The measurement results were applied against the applicable EMC requirements and limits outlined in the technical rules and regulations set forth in the Federal Communication's Commission Code of Federal Regulations Title 47 Part 2, Part 95 Subpart A and Subpart B; and Industry Canada Radio Standards Specification RSS-210 Issue 8 and RSS-Gen Issue 3.


2.0 REFERENCES



2.1 Normative References

ANSI/ISO 17025:2005	General Requirements for competence of testing and calibration laboratories
IEEE/ANSI C63.4:2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI/TIA/EIA-603-C:2004	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards
CFR Title 47 Part 2	Code of Federal Regulations Title 47: Telecommunication Part 2: Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
CFR Title 47 Part 95	Code of Federal Regulations Title 47: Telecommunication Part 95: Personal Radio Services Subpart A - General Mobile Radio Service (GMRS) Subpart B - Family Radio Service (FRS)
IC Spectrum Management & Telecommunications Policy	Radio Standards Specification RSS-210 Issue 8 - Low-Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment RSS-Gen Issue 3 - General Requirements and Information for the Certification of Radiocommunication Equipment

3.0 PASS/FAIL CRITERIA

Unless otherwise noted in the Appendices, the pass/fail criteria is the limit set forth in the reference standards. The DUT is considered to have passed the requirements if the data collected during the described measurement procedure is no greater than the specified limits as defined. The pass/fail statements made in this report only apply to the unit tested.

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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 Testing and Engineering Services Ltd.	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 Test Lab Certificate No. 2470.01
	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

4.0 FACILITIES AND ACCREDITATIONS

The facilities used in collecting the test results outlined in this report are located at 21-364 Lougheed Road, Kelowna, British Columbia, Canada V1X 7R8. The radiated emissions site conforms to the requirements set forth in ANSI C63.4 and is filed and listed with Industry Canada under File Number IC 3874A-1. Celltech test site is listed with the FCC as an accredited test facility.

5.0 GENERAL INFORMATION

5.1 Applicant Information




Company Name	GARMIN INTERNATIONAL INC.
Address	1200, East 151 st Street, Olathe, KS 66062 USA

5.2 DUT Description

Device Type	Portable FRS/GMRS Push-To-Talk Radio Transceiver with GPS	
Device Model(s)	Rino 650, Rino 655t (with camera)	
Test Sample Serial No.(s)	1766382247997103 (Identical Prototype) - Rino 655t	
Device Identifier(s)	FCC ID:	IPH-01767
	IC:	1792A-01767
Power Source Tested	Lithium-ion Battery (7.8V Nominal)	
Antenna Type Tested	Helix (Non-detachable)	
Antenna Gain	-1.8 dBi	

5.3 Rule Part(s) & Classification(s)

Rule Part(s) Applied	FCC	47 CFR §2; §95(A), §95(B)
	IC	RSS-210 Issue 8, RSS-Gen Issue 3
Device Classification(s)	FCC	Part 95 Family Radio Face Held Transmitter (FRF) - GMRS (Part 95A) Part 95 Family Radio Face Held Transmitter (FRF) - FRS (Part 95B)
	IC	Low-Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment (RSS-210) - GMRS/FRS

	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
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	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	
					Test Lab Certificate No. 2470.01

5.4 Mode(s) of Operation Tested

5.4.1 FRS/GMRS PTT Radio Transceiver

5.4.1.1 FRS

Transmitter Frequency Range(s)	462.5625 - 462.7125 MHz (Chan. 1-7)	467.5625 - 467.7125 MHz (Chan. 8-14)
Transmitter Test Channel(s)	467.5625 MHz (Channel 8)	
Transmitter Test Mode(s)	Enter TX Test Mode (keypad entry) - Select Channel (keypad entry); Continuous Transmit with PTT constantly depressed	
Modulation Type(s)	FM	

5.4.1.2 GMRS

Transmitter Frequency Range(s)	462.5625 - 462.7125 MHz (Chan. 1-7)	462.5500 - 462.7250 MHz (Chan. 15-22)
Transmitter Test Channel(s)	462.5625 MHz (Channel 1)	
Transmitter Test Mode(s)	Enter TX Test Mode (keypad entry) - Select Channel (keypad entry); Continuous Transmit with PTT constantly depressed	
Modulation Type(s)	FM	

5.5 Modification(s)


None




6.0 ANTENNA REQUIREMENT (FCC §95.647)

The antenna complies with the requirements set forth in FCC Rule Part 95.647.

7.0 ANTENNA REQUIREMENT (RSS-210 A6.1.4)

Complies

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
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Test Lab Certificate No. 2470.01

Appendix A RF Output Power Measurement

A.1 REFERENCES

Normative Reference Standard	FCC CFR 47 §2.1046(a), §2.1046(b), 2.1033(c)(6)(7), §95.639; IC RSS-210
Procedure Reference	The RF output power measurements were performed in accordance with TIA/EIA Standard 603 using the substitution method in an anechoic chamber.

A.2 LIMITS


FCC CFR 47 §95.639	Power output shall not exceed 0.50 Watts effective radiated power for the FRS channels. There can be no provisions for increasing the power or varying the power. No GMRS channel, under any condition of modulation, shall exceed: 1. 50W Carrier power (average TP during one modulated RF cycle) when transmitting emissions type A1D, F1D, G1D, A3E, F3E, or G3E. 2. 50W peak envelope TP when transmitting emission type H1D, J1D, R1D, H3E, J3E or R3E.
RSS-210 A6.1.4	The maximum permissible transmitter output power under any operating conditions is 0.5 W effective radiated power (e.r.p.). The radio shall be equipped with an integral antenna.
RSS-210 A6.2.4	A GMRS transmitter may transmit with a maximum power of 2 W e.r.p.




A.3 ENVIRONMENTAL CONDITIONS

Temperature	10 °C
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa

ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
00015	HP	E4408B	Spectrum Analyzer	03-May-12
00007	Gigatronics	8652A	Power Meter	04-May-12
00014	Gigatronics	80701A	Power Sensor	04-May-12
00072	EMCO	2075	Mini-mast	cnr
00073	EMCO	2080	Turn Table	cnr
00071	EMCO	2090	Multi-Device Controller	cnr
00015	HP	E4408B	Spectrum Analyzer	03-May-12
00050	Chase	CBL-6111A	Bilog Antenna	06-May-13
00055	EMCO	3121C	Dipole Antenna	27-Aug-12
00034	ETS	3115	Double Ridged Guide Horn	29-May-13

cnr = calibration not required

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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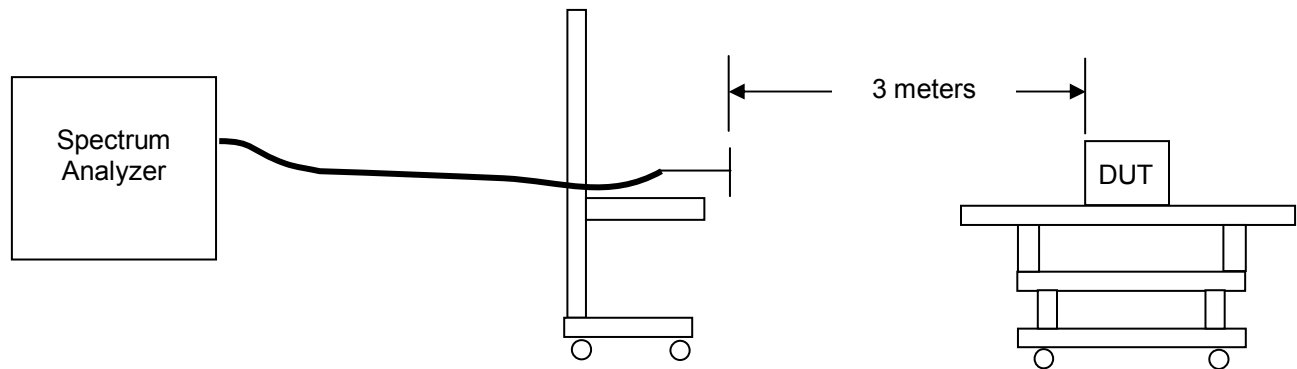
	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
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Test Lab Certificate No. 2470.01					


A.4 MEASUREMENT EQUIPMENT SETUP



MEASUREMENT EQUIPMENT CONNECTIONS	For the field strength measurements the measurement equipment was connected as shown in A.6. For the final substitutions the DUT was replaced with a dipole antenna and fed from a CW signal source sufficient to replicate the received field strength of the emission being investigated.		
	Frequency Range	RX Antenna	TX Antenna
	30 MHz - 1GHz	Bilog	Dipole
MEASUREMENT EQUIPMENT SETTINGS	For measuring the radiated field strength of the fundamental, the spectrum analyzer was set to the following settings:		
	Mode	RBW	VBW
		MHz	MHz
	GMRS (Hi Power)	1	3
	FRS (Lo Power)	1	3
			Detector
			Peak
			Peak

A.5 SETUP DRAWING

Figure A.5-1 - Setup Drawing – RF Output Power



Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS	DUT Model(s):	Rino 650, Rino 655t			
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	
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Test Lab Certificate No. 2470.01					

A.6 TEST RESULTS

Measured Frequency	Output Power (ERP)	
(MHz)	(Watts)	(dBm)
462.5625 (GMRS)	2.0	33.0
467.5625 (FRS)	0.16	22.0

Note(s):

1. Measured ERP Carrier Level (dBm) = Power Applied to Antenna (dBm) + Antenna Gain (dBd)
2. The DUT was measured in 3 orientations with respect to the receive antenna and the orientation with the highest Radiated Power results is shown (Vertical Polarization).

FCC Rule Part 2.1033 (C)(8) DC Input into final amplifier

Frequency	Voltage	Current
(MHz)	V	A
462.5625 (GMRS)	7.8	1.1
467.5625 (FRS)	7.8	0.14

A.7 PASS/FAIL

In reference to the results outlined in A.6, the DUT passes the requirements as stated in the reference standards.

A.8 SIGN-OFF


I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.



Sean Johnston
Lab Manager
Celltech Labs Inc.

May 18, 2011

Date

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS	DUT Model(s):	Rino 650, Rino 655t			
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Test Lab Certificate No. 2470.01

B.1 REFERENCES

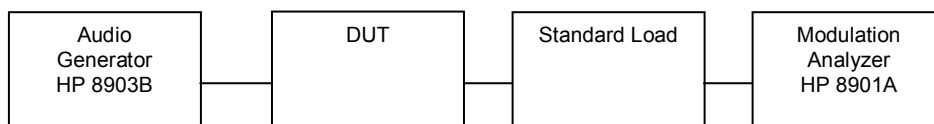
Normative Reference Standard	FCC CFR 47 §2.1047, §95.637; IC RSS-210
Procedure Reference	TIA-603-C

§95.637 (a)	(a) A GMRS transmitter that transmits emission types F1D, G1D, or G3E must not exceed a peak frequency deviation of plus or minus 5 kHz. A GMRS transmitter that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 5 kHz. A FRS unit that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 2.5 kHz, and the audio frequency response must not exceed 3.125 kHz.
RSS-210 A6.1.2	(c) The peak frequency deviation shall not exceed ± 2.5 kHz. The limiter shall be followed by a low-pass filter to remove unwanted harmonics.
RSS-210 A6.2.2	(b) For emission types F1D, G1D, G3E, F3E or F2D, the peak frequency deviation shall not exceed ± 5 kHz. GMRS transmitters must include an audio frequency low-pass filter, unless they comply with the appropriate emission masks in Section A6.2.5, below. The filter must be between the modulation limiter and the modulated stage of the transmitter. The filter attenuation must be as follows: for 3 kHz $\leq f \leq 20$ kHz, the attenuation is at least $60 \log_{10}(f, \text{kHz}/3)$ dB greater than the attenuation at 1 kHz, and for $f > 20$ kHz, the attenuation is at least 50 dB greater than the attenuation at 1 kHz.

Temperature	25 +/- 5 °C
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa

ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
00028	HP	8901A	Modulation Analyzer	21Jul11
00027	HP	8903B	Audio Generator/Analyzer	21Jul11

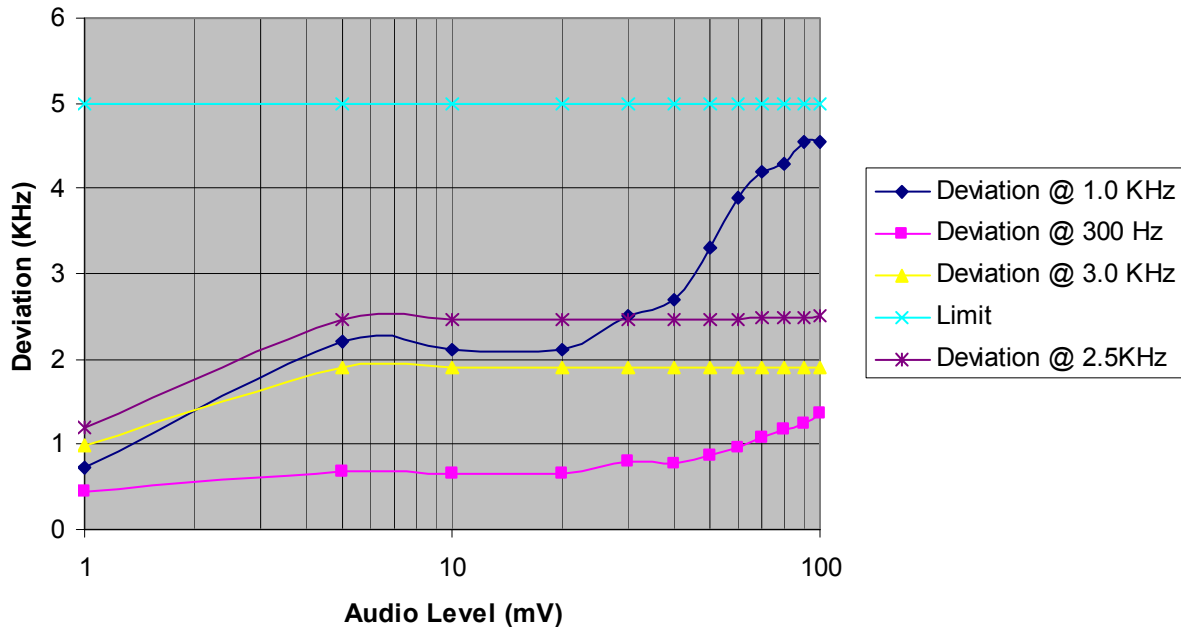
Figure B.5-1 - Setup Drawing – Modulation Characteristics



B.6 TEST RESULTS

B.6.1 GMRS

Audio Level	Deviation @ 1.0 KHz	Deviation @ 300 Hz	Deviation @ 3.0 KHz	Deviation @ 2.5 KHz	Limit
mV	[KHz]	[KHz]	[KHz]	[KHz]	[KHz]
1	0.73	0.45	0.98	1.19	5
5	2.2	0.68	1.90	2.47	5
10	2.1	0.66	1.91	2.47	5
20	2.1	0.65	1.91	2.47	5
30	2.50	0.80	1.91	2.47	5
40	2.70	0.77	1.91	2.47	5
50	3.30	0.86	1.91	2.47	5
60	3.90	0.96	1.91	2.47	5
70	4.20	1.08	1.91	2.49	5
80	4.30	1.17	1.91	2.49	5
90	4.55	1.24	1.91	2.49	5
100	4.55	1.37	1.91	2.50	5



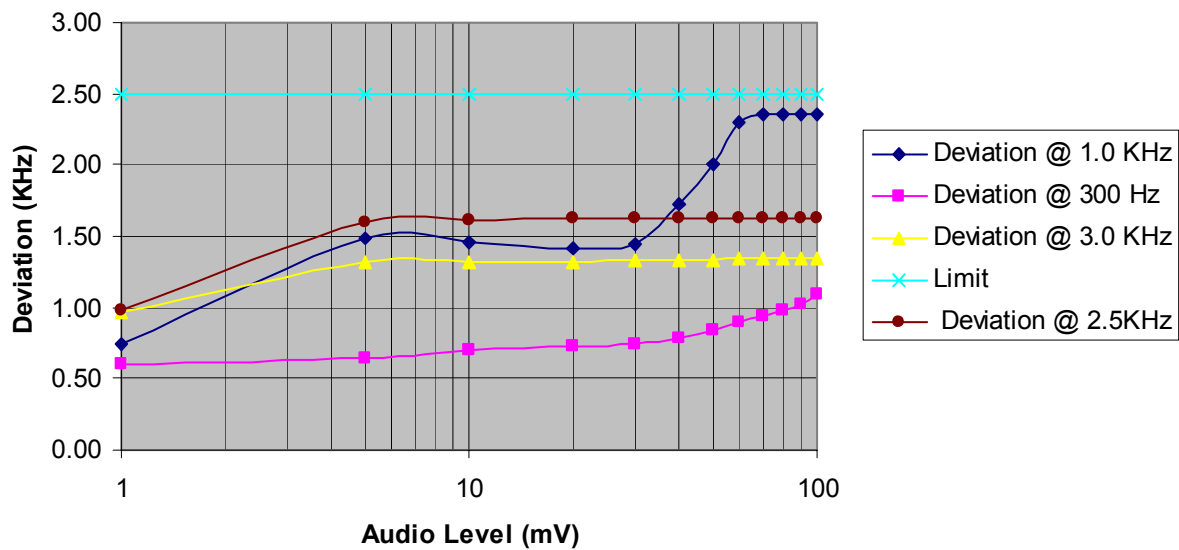
B.7 PASS/FAIL

In reference to the results outlined in B.6.1 the DUT passes the requirements as stated in the reference standards.

B.8 TEST RESULTS



B.8.1 FRS

Audio Level	Deviation @ 1.0 KHz	Deviation @ 300 Hz	Deviation @ 3.0 KHz	Deviation @ 2.5 KHz	Limit
mV	[KHz]	[KHz]	[KHz]	[KHz]	
1	0.75	0.60	0.97	0.98	2.5
5	1.48	0.65	1.32	1.60	2.5
10	1.46	0.70	1.32	1.61	2.5
20	1.41	0.73	1.32	1.62	2.5
30	1.44	0.75	1.33	1.62	2.5
40	1.72	0.79	1.33	1.62	2.5
50	2.00	0.84	1.33	1.62	2.5
60	2.30	0.90	1.35	1.62	2.5
70	2.35	0.94	1.35	1.62	2.5
80	2.35	0.98	1.35	1.62	2.5
90	2.35	1.02	1.35	1.62	2.5
100	2.35	1.10	1.35	1.62	2.5



B.9 PASS/FAIL

In reference to the results outlined in B.8.1 the DUT passes the requirements as stated in the reference standards.

	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	
					Test Lab Certificate No. 2470.01

B.10 SIGN-OFF


I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.






Sean Johnston
Lab Manager
Celltech Labs Inc.

June 8-10, 2011

Date

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	  Test Lab Certificate No. 2470.01
	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

Appendix C Modulation Characteristics (Audio Frequency Response)

C.1 REFERENCES

Normative Reference Standard	FCC CFR 47 §2.1047
Procedure Reference	TIA-603-C

C.2 LIMITS

§2.1047

a) *Voice modulated communication equipment.* A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

C.3 ENVIRONMENTAL CONDITIONS

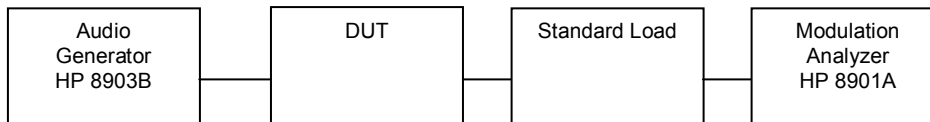
Temperature	25 +/- 5 °C
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa



C.4 EQUIPMENT LIST

ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
00028	HP	8901A	Modulation Analyzer	21Jul11
00027	HP	8903B	Audio Generator/Analyzer	21Jul11

C.5 SETUP DRAWING

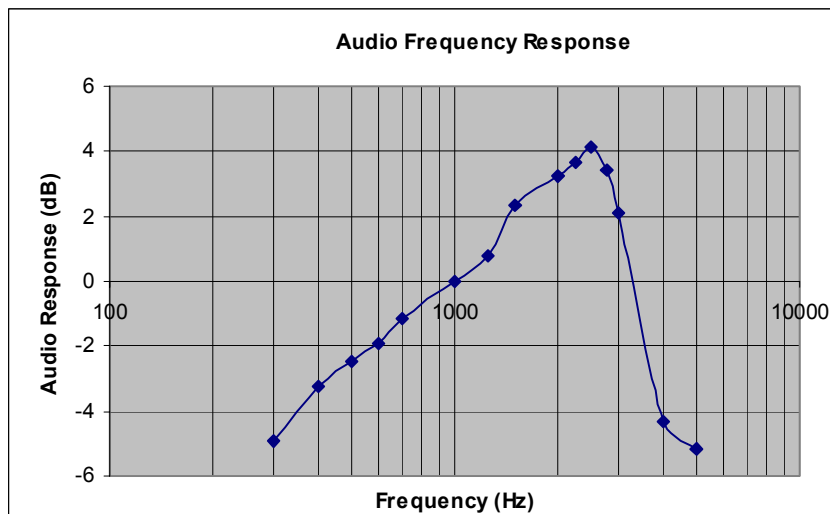
Figure C.5-1 - Setup Drawing – Audio Frequency Response



	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	
	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #. 3874A-1	
Test Lab Certificate No. 2470.01					

C.6 TEST RESULTS

Audio Frequency	Deviation
[Hz]	[kHz]
300	-4.94
400	-3.23
500	-2.45
600	-1.92
700	-1.12
1000	0
1250	0.76
1500	2.32
2000	3.21
2250	3.64
2500	4.12
2750	3.45
3000	2.1
4000	-4.32
5000	-5.14
6000	-5.14



C.7 PASS/FAIL

In reference to the results outlined in C.6 the DUT passes the requirements as stated in the reference standards.

C.8 SIGN-OFF


I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.






Sean Johnston
Lab Manager
Celltech Labs Inc.

June 8-10, 2011

Date

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS			DUT Model(s):	Rino 650, Rino 655t	
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	
					Test Lab Certificate No. 2470.01

Appendix D Modulation Characteristics (Low-pass Filter Response)

D.1 REFERENCES

Normative Reference Standard	FCC CFR 47 §2.1047, §95.637; IC RSS-210
Procedure Reference	TIA-603-C

D.2 LIMITS

§95.637 & RSS-210 A6.2.2	(b) Each GMRS transmitter, except a mobile station transmitter with a power output of 2.5 W or less, must automatically prevent a greater than normal audio level from causing overmodulation. The transmitter also must include audio frequency low-pass filtering, unless it complies with the applicable paragraphs of §95.631 (without filtering.) The filter must be between the modulation limiter and the modulated stage of the transmitter. At any frequency (f in kHz) between 3 and 20 kHz, the filter must have an attenuation of at least $60 \log_{10}(f/3)$ 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.
--------------------------------	---

D.3 ENVIRONMENTAL CONDITIONS

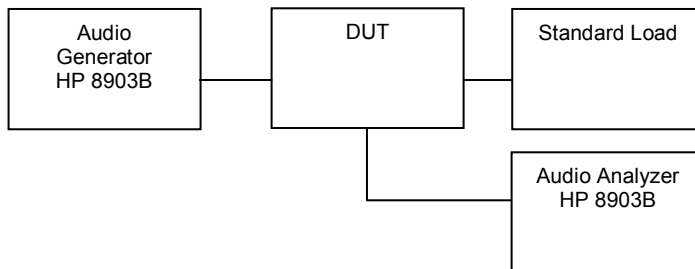
Temperature	25 +/- 5 °C
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa




D.4 EQUIPMENT LIST

ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
00027	HP	8903B	Audio Generator/Analyzer	21Jul11

D.5 SETUP DRAWING

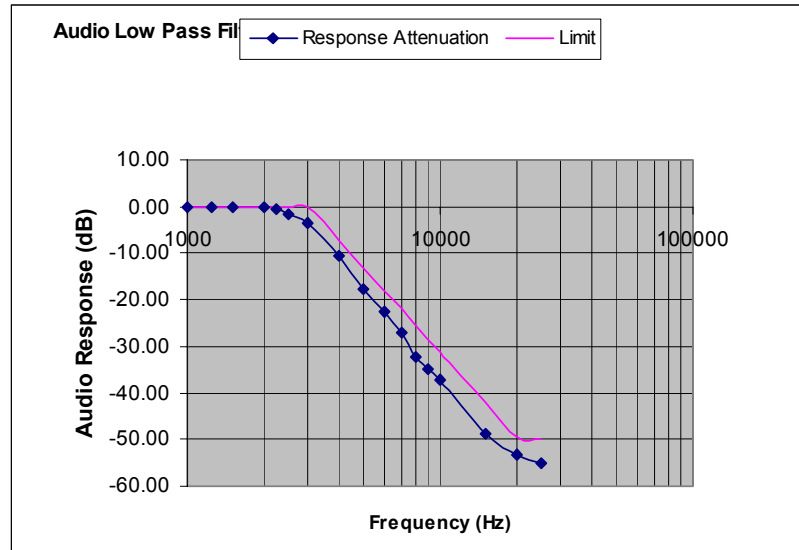
Figure D.5-1 - Setup Drawing – Low-pass Filter Response



	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	  Test Lab Certificate No. 2470.01
	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

D.6 TEST RESULTS

Audio Frequency	Response Attenuation	Limit
[Hz]	[dB]	[dB]
1000	0.00	0
1250	-0.05	0
1500	-0.08	0
2000	-0.20	0
2250	-0.63	0
2500	-1.56	0
3000	-3.50	0
4000	-10.54	-7.4
5000	-17.56	-13.3
6000	-22.40	-18
7000	-27.20	-22
8000	-32.30	-25.5
9000	-35.10	-28.6
10000	-37.10	-31.3
15000	-48.70	-41.9
20000	-53.20	-49.4
25000	-55.22	-50



D.7 PASS/FAIL

In reference to the results outlined in D.6, the DUT passes the requirements as stated in the reference standards.

D.8 SIGN-OFF


I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.






Sean Johnston
Lab Manager
Celltech Labs Inc.

June 8-10, 2011

Date

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

Test Lab Certificate No. 2470.01

Appendix E Occupied Bandwidth and Emission Mask

E.1 REFERENCES

Normative Reference Standard	FCC CFR 47 §2.1049, §95.633, §95.635; IC RSS-210
Procedure Reference / Description	Occupied bandwidth was performed by connecting the output of the DUT to the input of a spectrum analyzer. The unit was supplied a 2500Hz audio signal and the 20dB bandwidth was measured for both the FRS and GMRS modes.

E.2 LIMITS

§95.633 & RSS-210 A6.1.3, A6.2.3	The <i>authorized bandwidth</i> (maximum permissible bandwidth of a transmission) for emission type H1D, J1D, R1D, H3E, J3E or R3E is 4 kHz. The authorized bandwidth for emission type A1D or A3E is 8 kHz. The authorized bandwidth for emission type F1D, G1D, F3E or G3E is 20 kHz. The authorized bandwidth for emission type F3E or F2D transmitted by a FRS unit is 12.5 kHz.
§95.635 & RSS-210 A6.1.5, A6.2.5	At least 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth. At least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth. At least 43 + 10 log ₁₀ (T) dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

E.3 ENVIRONMENTAL CONDITIONS

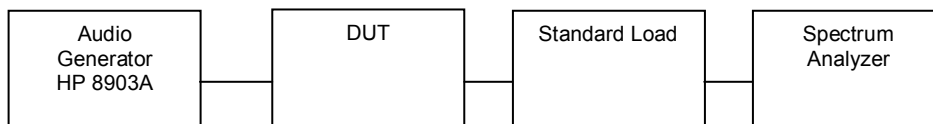
Temperature	10 °C
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa


E.4 EQUIPMENT LIST



ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
00051	HP	8566B	Spectrum Analyzer RF Section	03-May-12
00047	HP	85685A	RF Preselector	05-May-12
00027	HP	8903B	Audio Generator/Analyzer	21-Jul-11

E.5 SETUP DRAWING

Figure E.5-1 - Setup Drawing – Occupied Bandwidth & Emission Mask



Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):		Rino 650, Rino 655t	
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Page 19 of 39						

	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 Test Lab Certificate No. 2470.01
	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

E.6 EMISSION DESIGNATOR & FREQUENCIES

Emission Types:

GMRS: KF3E & KF2D

FRS: KF3E & KF2D

GMRS Authorized Bandwidth 20.0 kHz


2.1033(c)(5) GMRS Frequency Range (MHz):
95.621




1. 462.5500 13. 462.7000
2. 462.5625 14. 462.7125
3. 462.5750 15. 462.7250
4. 462.5875
5. 462.6000
6. 462.6125
7. 462.6250
8. 462.6375
9. 462.6500
10. 462.6625
11. 462.6750
12. 462.6875

FRS Authorized Bandwidth 12.5 kHz

2.1033(c)(5) FRS Frequency Range (MHz):
95.627

1. 462.5625 8. 467.5625
2. 462.5875 9. 467.5875
3. 462.6125 10. 467.6125
4. 462.6375 11. 467.6375
5. 462.6625 12. 467.6625
6. 462.6875 13. 467.6875
7. 462.7125 14. 467.7125

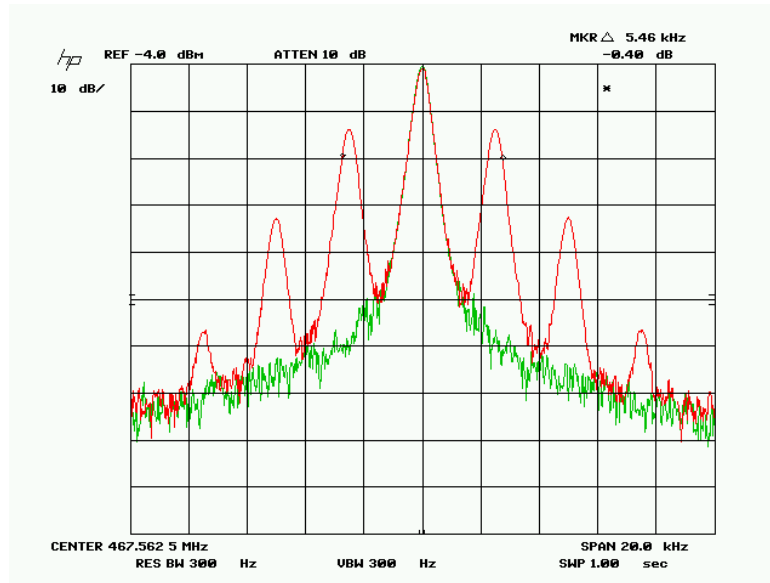
Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS			DUT Model(s):	Rino 650, Rino 655t	
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	  Test Lab Certificate No. 2470.01
	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

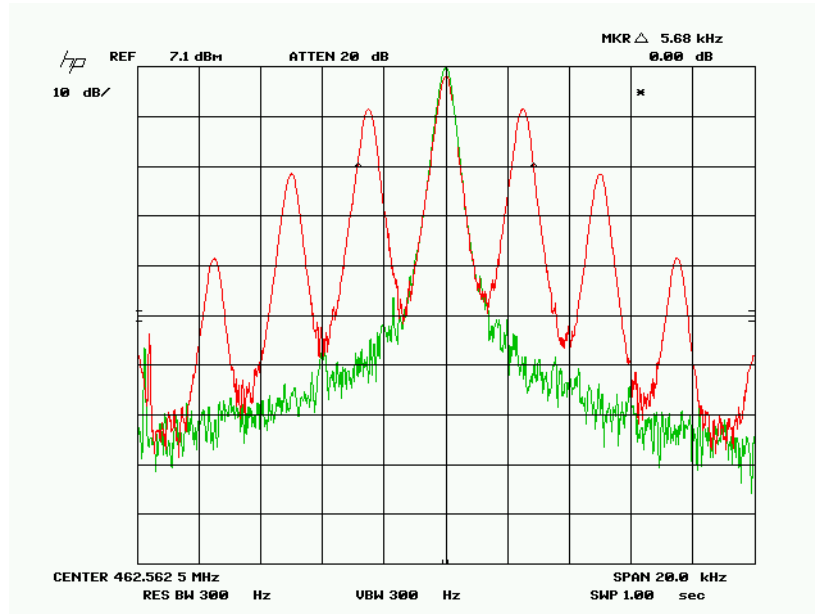
E.7 TEST RESULTS


E.7.1 Occupied Bandwidth



E.7.1.1 FRS



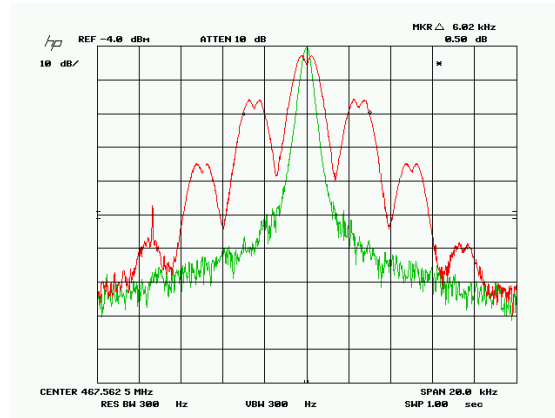
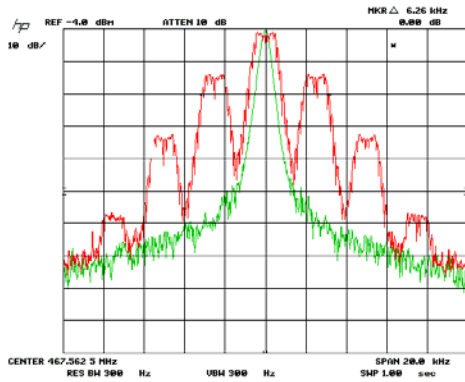
E.7.1.2 GMRS



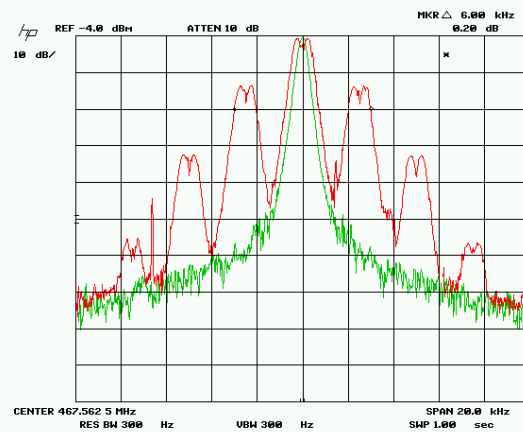
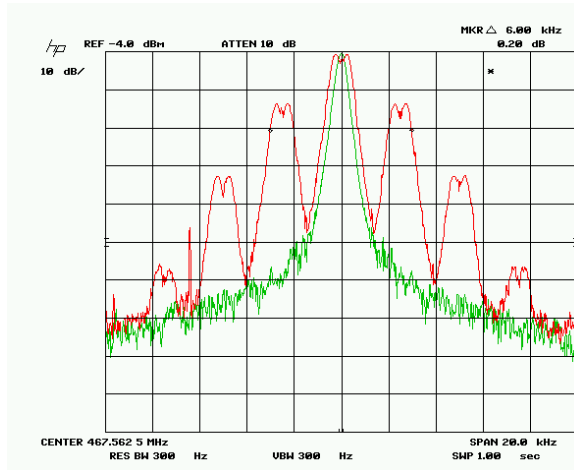
Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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 Testing and Engineering Services Ltd.	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 Test Lab Certificate No. 2470.01
	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B	Test Site Registration:	FCC Accredited Site	
		IC RSS-210 (8), RSS-Gen (3)		IC Site File #: 3874A-1	


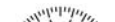

E.7.1.3 FRS CTCSS [1 & 38]



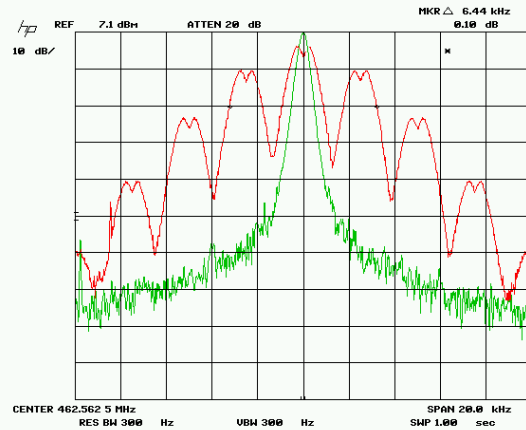
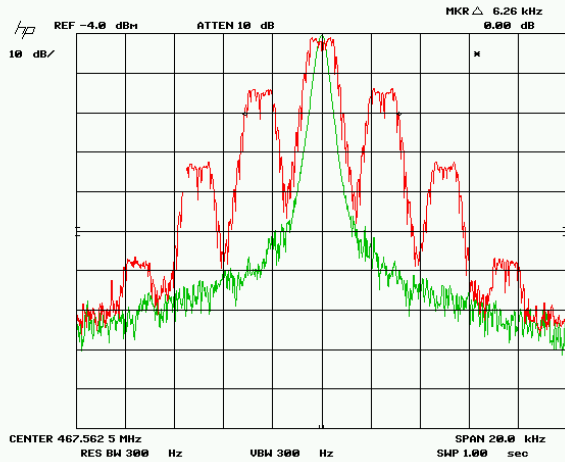
E.7.1.4 FRS DCS [1 & 83]



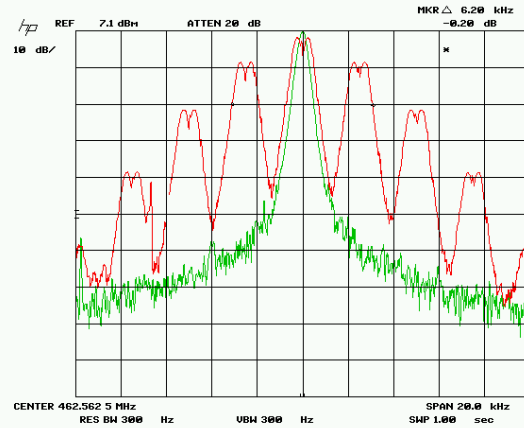
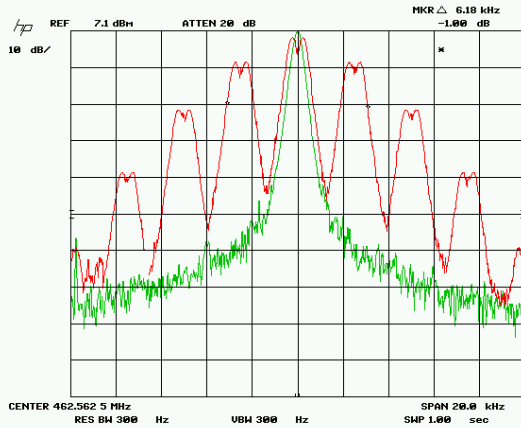
Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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 Testing and Engineering Services Ltd.	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	  Test Lab Certificate No. 2470.01
	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B	Test Site Registration:	FCC Accredited Site	
		IC RSS-210 (8), RSS-Gen (3)		IC Site File #: 3874A-1	




E.7.1.5 GMRS CTCSS [1 & 38]



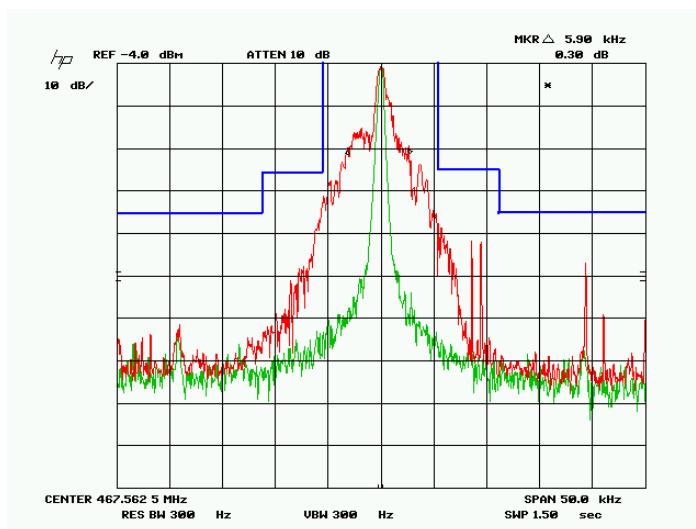
E.7.1.6 GMRS DCS [1 & 83]



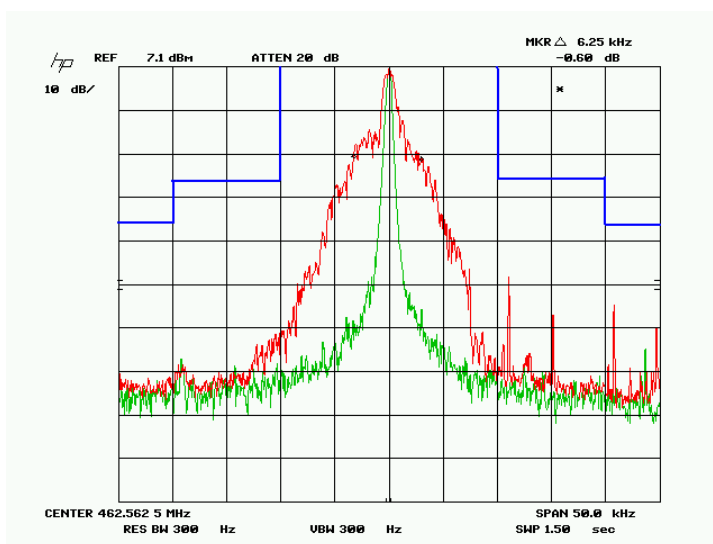
Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	
					Test Lab Certificate No. 2470.01




E.7.1.7 FRS Digital



E.7.1.8 GMRS Digital

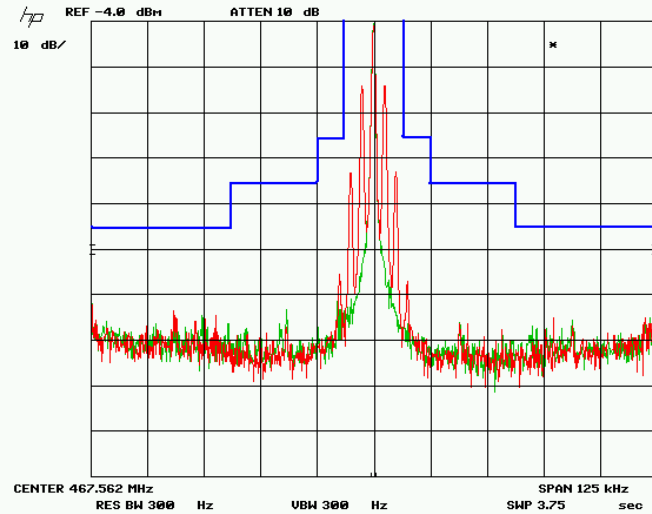


Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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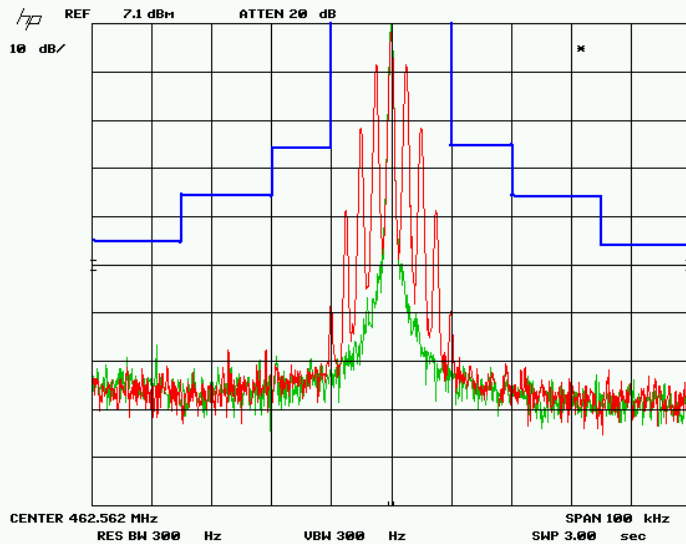
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	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

E.7.2 Emission Mask

E.7.2.1 FRS






E.7.2.2 GMRS



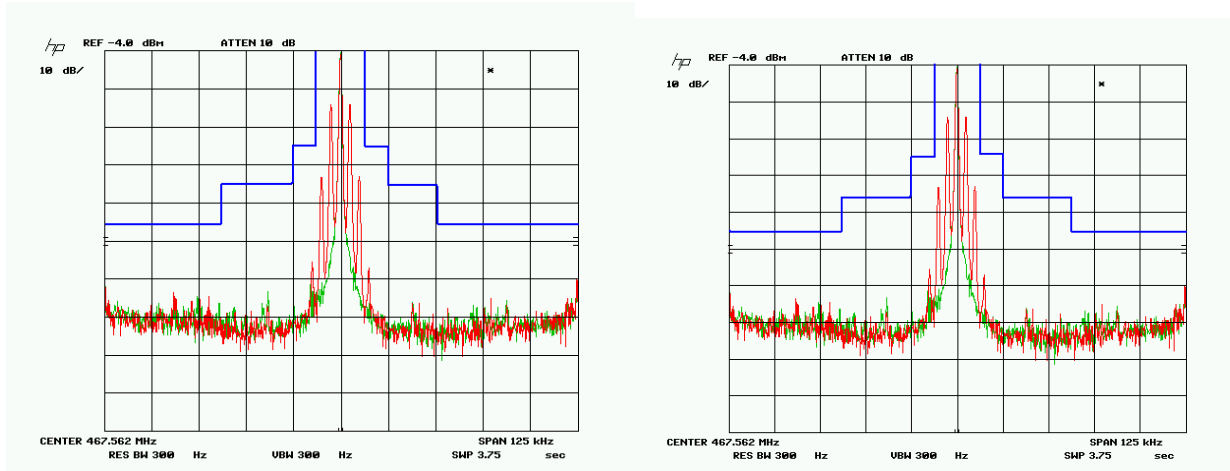
E.8 PASS/FAIL

In reference to the results outlined in E.7, the DUT passes the requirements as stated in the reference standards.

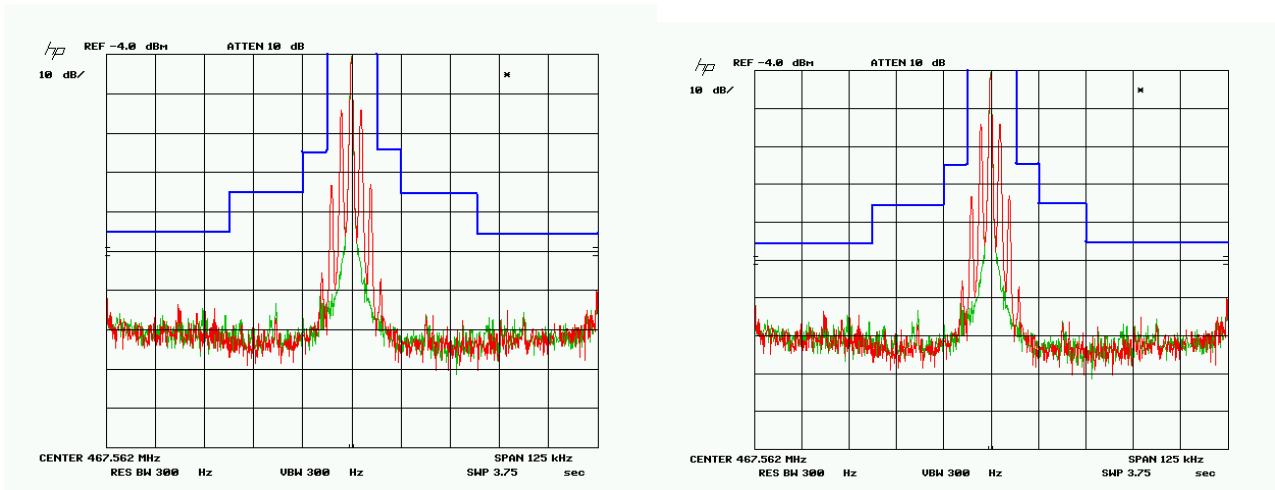
Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B	Test Site Registration:	FCC Accredited Site	
		IC RSS-210 (8), RSS-Gen (3)		IC Site File #: 3874A-1	




E.8.1.1 FRS CTCSS 1 & 38



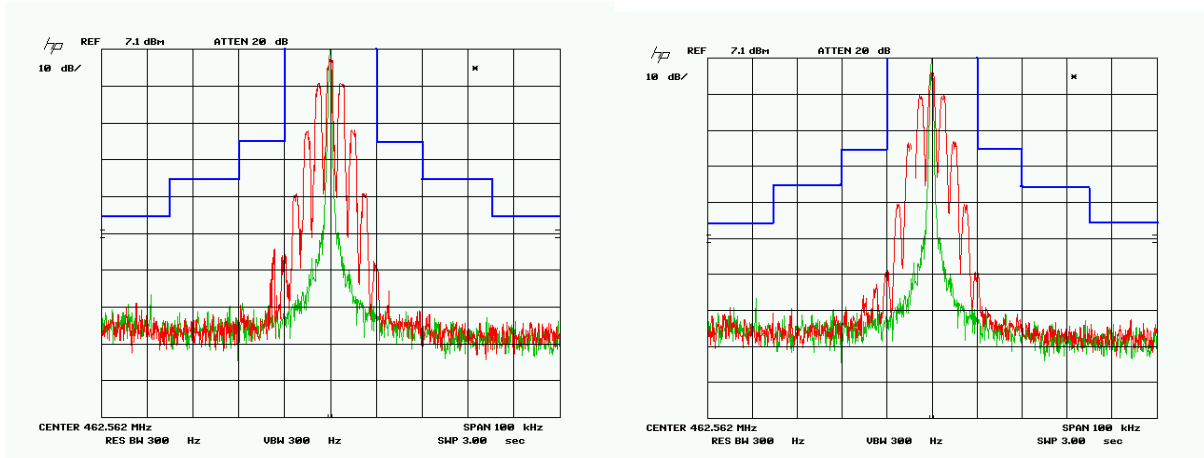
E.8.1.2 FRS DCS 1 & 83



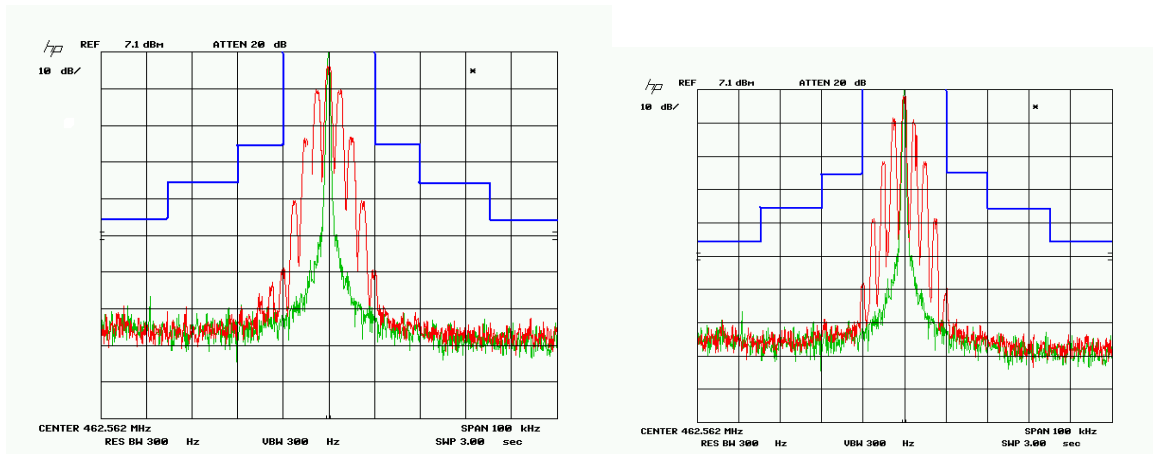
Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	
					Test Lab Certificate No. 2470.01



E.8.1.3 GMRS CTCSS 1 & 38



E.8.1.4 GMRS DCS 1 & 83



Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	
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	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	
					Test Lab Certificate No. 2470.01

E.9 PASS/FAIL

In reference to the results outlined in E.7 & E.8, the DUT passes the requirements as stated in the reference standards.

E.10 SIGN-OFF


I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.






Sean Johnston
Lab Manager
Celltech Labs Inc.

June 1-3, 2011

Date

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511PH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

Test Lab Certificate No. 2470.01

Appendix F Radiated Spurious Emissions - TX

F.1 REFERENCES

Normative Reference Standard	FCC CFR 47 §2.1053, §95.635 (b) (7); IC RSS-210
Procedure Reference	The transmitter spurious emissions were measured in accordance with TIA/EIA Standard 603 using the substitution method on a 3-meter open area test site (OATS).

F.2 LIMITS

§95.635 & RSS-210 A6.1.5, A6.2.5	(7) At least $43 + 10 \log_{10}(T)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250%.
--	--


F.3 ENVIRONMENTAL CONDITIONS




Temperature	10 °C
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa

F.4 EQUIPMENT LIST

ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
00072	EMCO	2075	Mini-mast	cnr
00073	EMCO	2080	Turn Table	cnr
00071	EMCO	2090	Multi-Device Controller	cnr
00015	HP	E4408B	Spectrum Analyzer	03-May-12
00050	Chase	CBL-6111A	Bilog Antenna	03-May-13
00055	EMCO	3121C	Dipole Antenna	27-Aug-12
00034	ETS	3115	Double Ridged Guide Horn	29-May-12
00035	ETS	3115	Double Ridged Guide Horn	29-May-12
00051	HP	8566B	Spectrum Analyzer RF Section	03-May-12
00049	HP	85650A	Quasi-peak Adapter	06-May-12
00047	HP	85685A	RF Preselector	05-May-12
00006	R & S	SMR 20	Signal Generator (10MHz-40GHz)	30-Apr-12
00114	Amplifier Research	DC7154	Directional Coupler (0.8-4.2 GHz)	cnr
00078	Pasternack	PE2214-20	Directional Coupler (1-18 GHz)	cnr
00106	Amplifier Research	5S1G4	Power Amplifier (5W, 800MHz-4.2GHz)	cnr
00041	Amplifier Research	10W1000C	Power Amplifier (0.5 - 1 GHz)	cnr
00007	Gigatronics	8652A	Power Meter	04-May-12
00014	Gigatronics	80701A	Power Sensor	04-May-12

cnr = calibration not required

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

Test Lab Certificate No. 2470.01

F.5 MEASUREMENT EQUIPMENT SETUP

MEASUREMENT EQUIPMENT CONNECTIONS

For the field strength measurements, the measurement equipment was connected as shown in F.6. A number of antennas were used to cover the applicable frequency range tested. The ranges in which each antenna was used are as follows. For the final substitutions, the DUT was replaced with the appropriate antenna and fed from a CW signal source sufficient to replicate the received field strength of the emission being investigated.

Frequency Range	RX Antenna	TX Antenna
30 MHz - 1GHz	Bilog	Dipole
1 GHz - 18 GHz	ETS 3115 Horn	ETS 3115 Horn

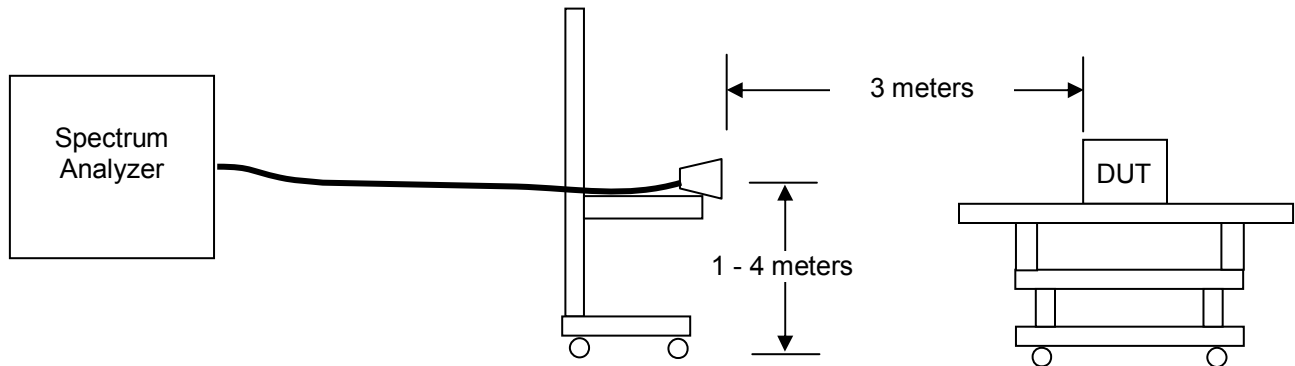
MEASUREMENT EQUIPMENT SETTINGS


For measuring the radiated field strength of the fundamental, the spectrum analyzer was set to the following settings:




Mode	RBW	VBW	Detector
	MHz	MHz	
GMRS (Hi Power)	1	3	Peak
FRS (Lo Power)	1	3	Peak

F.6 SETUP DRAWING

Figure F.6-1 - Setup Drawing – Radiated TX Spurious Emissions



Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	
					Test Lab Certificate No. 2470.01

F.7 TEST RESULTS

GMRS TX: 462.5625 MHz

Measured Output Power: 2.0 W, Limit: $43+10\log(W)$ = 46.0dBc

Emissions (MHz)	Attenuation (dBc)	Limit (dBc)	Margin (dB)
462.5625	-	-	-
925.125	53.2	46	7.2
1387.6875	65.3	46	19.3

FRS TX: 467.5625 MHz

Measured Output Power: 0.16 W, Limit: $43+10\log(W)$ = 35.0dBc

Emissions (MHz)	Attenuation (dBc)	Limit (dBc)	Margin (dB)
467.5625	-	-	-
935.125	66.0	35.0	31

Note(s):

1. Measured ERP Carrier Level (dBm) = Power Applied to Antenna (dBm) + Antenna Gain (dBd)
2. The DUT was measured in 3 orientations with respect to the receive antenna and the orientation with the highest Radiated Power results is shown (Vertical Polarization).
3. The emissions reported above represent the highest emissions within the frequency band of 30MHz and the 10th harmonic of the carrier. All other emissions were at the noise floor.
4. The DUT was measured with and without the optional speaker-microphone audio accessory connected to the audio jack of the DUT, and the worst-case configuration is reported (without the speaker-microphone audio accessory).

F.8 PASS/FAIL

In reference to the results outlined in F.7 the DUT passes the requirements as stated in the reference standards.

F.9 SIGN-OFF


I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.






Sean Johnston
Lab Manager
Celltech Labs Inc.

June 6-7, 2011


Date




Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	  Test Lab Certificate No. 2470.01
	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

F.10 TEST SETUP PHOTOGRAPH



Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

Test Lab Certificate No. 2470.01

Appendix G Radiated Spurious Emissions - RX

G.1 REFERENCES

Normative Reference Standard	IC RSS-210
Procedure Reference(s)	The procedure used was ANSI C63.4-2003. The frequency was scanned from 30 MHz to 1.0 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The DUT was measured in three (3) orthogonal planes. RSS-Gen 4.10

G.2 LIMITS

RSS-Gen 6.(a)	Frequency (MHz)	Limits
	30-88	40.0 dBuV/m measured @ 3 meters
	80-216	43.5 dBuV/m measured @ 3 meters
	216-960	46.0 dBuV/m measured @ 3 meters
	Above 960	54.0 dBuV/m measured @ 3 meters


G.3 ENVIRONMENTAL CONDITIONS




Temperature	10 °C
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa

G.4 EQUIPMENT LIST

ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
00072	EMCO	2075	Mini-mast	cnr
00073	EMCO	2080	Turn Table	cnr
00071	EMCO	2090	Multi-Device Controller	cnr
00015	HP	E4408B	Spectrum Analyzer	03-May-12
00050	Chase	CBL-6111A	Bilog Antenna	03-May-13
00051	HP	8566B	Spectrum Analyzer RF Section	03-May-12
00049	HP	85650A	Quasi-peak Adapter	06-May-12
00047	HP	85685A	RF Preselector	05-May-12
00006	R & S	SMR 20	Signal Generator (10MHz-40GHz)	30-Apr-12

cnr = calibration not required

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
	Measurement Dates:	May 18, June 01-10 , 2011	Test Report Revision:	Rev. 1.0	
	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	
Test Lab Certificate No. 2470.01					

G.5 MEASUREMENT EQUIPMENT SETUP

MEASUREMENT EQUIPMENT CONNECTIONS

For the field strength measurements, the measurement equipment was connected as shown in G.6. Various antenna types may be required to cover the applicable frequency range tested. The ranges in which each antenna was used are shown below.

Frequency Range	RX Antenna	TX Antenna
30 MHz - 1GHz	Bilog	N/a
1 GHz - 18 GHz	ETS 3115 Horn	N/a

MEASUREMENT EQUIPMENT SETTINGS

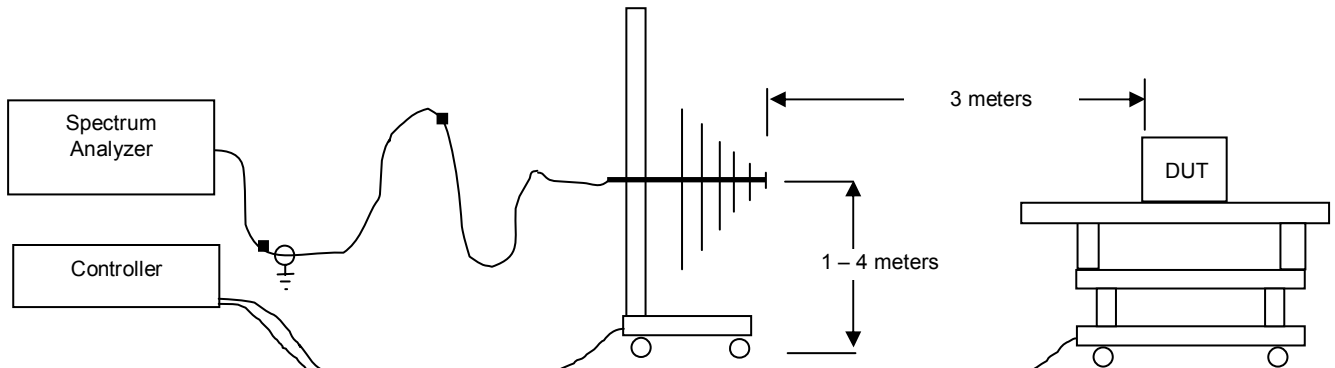
For the spurious out-of-band emissions, the spectrum analyzer was set to the following settings:


Measurement	RBW	VBW	Detector
	kHz	kHz	
< 1 GHz	100	300	Peak*
> 1 GHz	1000	3000	Peak*



* As a worst-case measurement, the QP limit was applied to measurements made with a peak detector.

G.6 SETUP DRAWING

Figure G.6-1 - Setup Drawing – Radiated RX Spurious Emissions



Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	
	Measurement Dates:	May 18, June 01-10, 2011	Test Report Revision:	Rev. 1.0	
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Test Lab Certificate No. 2470.01

G.7 TEST RESULTS

Tuned Frequency	Emission Frequency	Receiver	DUT	Ant Pol	Cable Loss	Correction Factor	Field Strength	Limit	Margin
MHz	MHz	dBuv			dB	dB	dBuv/m	dBuv/m	dB
Ch1	440.6	10.5	V	V	1.8	16.7	29	46	17
	440.6	13.3	V	H	1.8	17.1	32.2	46	13.8
	881.2	12.2	V	V	2	23.2	37.4	46	8.6
	881.2	10.3	V	H	2	23.2	35.5	46	10.5
CH8	446.2	9.4	V	V	1.8	16.9	28.1	46	17.9
	446.2	11.8	V	H	1.8	17.1	30.7	46	15.3
	892.4	12.2	V	V	2	23.2	37.4	46	8.6
	892.4	11.2	V	H	2	23.2	36.4	46	9.6

Note: The emissions reported above represent the highest emissions or noise floor measured within the frequency band of 30MHz and the 10th harmonic of the carrier. All other emissions were at the noise floor.

Formulae:

Total CF = Antenna Factor + Cable Factor + Other Factor (Amplifier Gain, filter loss, etc)

Field Strength = SA Reading + Total CF

The frequency points reported describe the highest emission measured in each of the ranges tested and are used to describe the measured spectrum as a whole. It is shown that the highest emissions measured within the spectrum pass the appropriate limits; therefore all emissions within the bands would also meet the requirements.

G.8 PASS/FAIL

In reference to the results outlined in G.7 the DUT passes the requirements as stated in the reference standard.

G.9 SIGN-OFF


I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.






Sean Johnston
Lab Manager
Celltech Labs Inc.

June 6-7, 2011

Date

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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Appendix H Frequency Stability

H.1 REFERENCES

Normative Reference Standard	FCC CFR 47 §2.1055, §95.621, §95.627; IC RSS-210
Procedure Reference / Description	<p>§95.621 (a) The frequency stability shall be measured with variation of ambient temperature as follows:</p> <p>(1) From -30° to +50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.</p> <p>(2) From -20° to +50° Family Radio Service under part 95 of this chapter.</p>

H.2 LIMITS

§95.621	(b) Each GMRS transmitter for mobile station, small base station and control station operation must be maintained within a frequency tolerance of 0.0005%. Each GMRS transmitter for base station (except small base), mobile relay station or fixed station operation must be maintained within a frequency tolerance of 0.00025%.
§95.627	(b) Each FRS unit must be maintained within a frequency tolerance of 0.00025%.
RSS-210 A6.1.6	FRS Devices: Carrier frequency tolerance shall be better than ± 5 ppm
RSS-210 A6.2.6	GMRS Devices: Carrier frequency tolerance shall be better than ± 5 ppm

H.3 ENVIRONMENTAL CONDITIONS

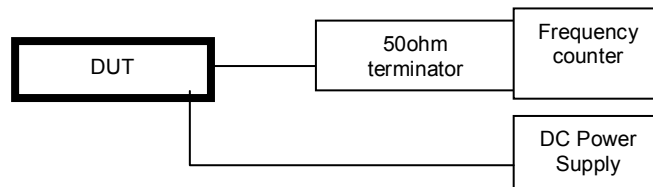
Temperature	25 +/- 5 °C
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa


H.4 EQUIPMENT LIST




ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
na	ESPEC	ECT-2	Heater/Refrigerator	na
0003	HP	53181A	Frequency Counter	09-Apr-12
na	HP	E3611A	DC Power Supply	Na
00207	VWR	na	Temperature Humidity Monitor	09-Apr-12

H.5 SETUP DRAWING

Figure H.5-1 - Setup Drawing – Frequency Stability



Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Rule Part(s) Applied:	FCC 47 CFR §2, §95A, §95B IC RSS-210 (8), RSS-Gen (3)	Test Site Registration:	FCC Accredited Site IC Site File #: 3874A-1	

H.6 TEST RESULTS

Channel: 1 GMRS

Temperature (degrees C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (%)	Frequency tolerance with reference to value @ 20 °C (ppm)
-30	462.56250	462.5626154	0.000025%	0.149817577
-20	462.56250	462.5625275	0.000006%	-0.040210778
-10	462.56250	462.5625573	0.000012%	0.024212942
0	462.56250	462.5626027	0.000022%	0.122361831
10	462.56250	462.5626111	0.000024%	0.140521537
20	462.56250	462.5625461	0.000010%	0
30	462.56250	462.5625103	0.000002%	-0.077394939
40	462.56250	462.5624725	-0.000006%	-0.159113617
50	462.56250	462.5623803	-0.000026%	-0.358438013

Channel: 8 FRS

Temperature (degrees C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (%)	Frequency tolerance with reference to value @ 20 °C (ppm)
-30	467.56250	467.5625474	0.000010%	0.101376821
-20	467.56250	467.5625299	0.000006%	0.06394867
-10	467.56250	467.5625633	0.000014%	0.13538297
0	467.56250	467.5626028	0.000022%	0.219863655
10	467.56250	467.5626160	0.000025%	0.248095174
20	467.56250	467.5625000	0.000000%	0
30	467.56250	467.5625108	0.000002%	0.023098516
40	467.56250	467.5624234	-0.000016%	-0.163828365
50	467.56250	467.5623853	-0.000025%	-0.245314797

Channel Frequency

1

Channel Frequency Assigned

462.5625000

Reference Frequency (20 C)

462.5625461

Channel Frequency

8


Channel Frequency Assigned




467.562500
0

Reference Frequency (20 C)

467.562500
0

Voltage (V)	Frequency (MHz)	%Deviation	PPM to assigned	Voltage (V)	Frequency (MHz)	%Deviation	PPM to assigned
6.63	462.5626098	0.000024%	0.2374	4.08	467.5625742	0.000016%	0.1587
8.97	462.5626048	0.000023%	0.2266	5.52	467.5625795	0.000017%	0.1700
	Frequency (MHz)	%Deviation	PPM to reference		Frequency (MHz)	%Deviation	PPM to reference
6.63	462.5628094	0.000057%	0.5692	4.08	467.5625542	0.000012%	0.1159
8.97	462.5628018	0.000055%	0.5528	5.52	467.5626795	0.000038%	0.3839

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS			DUT Model(s):	Rino 650, Rino 655t	
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
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					Test Lab Certificate No. 2470.01

H.7 PASS/FAIL

In reference to the results outlined in H.6 the DUT passes the requirements as stated in the reference standards.

H.8 SIGN-OFF


I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.






Sean Johnston
Lab Manager
Celltech Labs Inc.


June 8, 2011

Date

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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	Test Report Serial No.:	041511IPH-T1094-E95U	Test Report Issue Date:	July 15, 2011	 
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					Test Lab Certificate No. 2470.01

END OF DOCUMENT

Applicant:	Garmin International Inc.	FCC ID:	IPH-01767	IC:	1792A-01767	
DUT Type:	Portable 5W UHF FRS/GMRS PTT Radio Transceiver w/ GPS		DUT Model(s):	Rino 650, Rino 655t		
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