Test Report Serial Number:	45461357R1.1
Test Report Date:	13 September 2016
Project Number:	1354

EMC Test Report - New Filing

Applicant:

AWIRE Technology Corp.
41099 Circle 5 Estates
Calgary, Alberta, T3Z 2T4
Canada

FCC ID:	IC Registration Number
2AIGO-AW1001	21479-AW1001
Product Model Number / HVIN	**Product Name / PMN**
Stealth-AW1001	Stealth-AW1001

In Accordance With:

FCC 47 CFR §95A, §95B
General Mobile Radio Service (GMRS), Family Radio Service (FRS)

RSS-210
License-exempt Radio Apparatus (All Frequency Bands): Category 1 Equipment

Approved By:

Ben Hewson, President
Celltech Labs Inc.
21-364 Lougheed Rd.
Kelowna, BC, V1X 7R8
Canada

Test Lab Certificate: 2470.01 **IC Registration 3874A-1** **FCC Registration: 714830**

Table of Contents

1.0 DOCUMENT CONTROL

Tested By:	**Art Voss**
Prepared By:	**Art Voss**
Reviewed By:	**Ben Hewson**

Issue Number	Description	By	Issue Date
1.0	Initial Release	Art Voss	26 August 2016
1.1	Corrections Per TCB	Art Voss	13 Septembert 2016

2.0 TEST RESULT SUMMARY

TEST SUMMARY

Referenced Standard(s):		FCC CFR Title 47 Parts 2, 27, 15B				
Appendix	**Description of Test**	**Procedure Reference**	**FCC Limit Reference**	**ISEDC Limit Reference**	**Test Date**	**Result**
A	Conducted Power (Fundemental)	ANSI/TIA/EIA-603-D ANSI C63.4:2014	§95.639 §2.1046	RSS-Gen RSS-210 A6.1.4, A6.2.4	23 June 2016	Pass
B	Modulation Characteristics	ANSI/TIA/EIA-603-D ANSI C63.4:2014	§95.637 §2.1047	RSS-Gen RSS-210 A6.1.2, A6.2.2	21 June 2016	Pass
C	Occupied Bandwidth	ANSI/TIA/EIA-603-D ANSI C63.4:2014	§95.633 §2.1049	RSS-Gen RSS-210 A6.1.3, A6.2.3	23 June 2016	Pass
D	Emission Masks	ANSI/TIA/EIA-603-D ANSI C63.4:2014	§95.635 §2.1049	RSS-Gen RSS-210 A6.1.3, A6.2.3	23 June 2016	Pass
E	Conducted Spurious Emissions	ANSI/TIA/EIA-603-D ANSI C63.4:2014	§95.635 §2.1051	RSS-Gen RSS-210 A6.1.5, A6.2.5	8 July 2016	Pass
F	Radiated TX Spurious Emissions	ANSI/TIA/EIA-603-D ANSI C63.4:2014	§95.635 §2.1053	RSS-Gen RSS-210 A6.1.5, A6.2.5	6 July 2016	Pass
G	Radiated RX Spurious Emissions	ANSI/TIA/EIA-603-D ANSI C63.4:2014	§15B	ICES-003	6 July 2016	Pass
H	Frequency Stability	ANSI/TIA/EIA-603-D ANSI C63.4:2014	§95.621, §95.627 §2.1055	RSS-Gen RSS-210 A6.1.6, A6.2.6	24 June 2016	Pass

3.0 PASS/FAIL CRITERIA

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 measurement and test results obtained 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.

I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel under my direct supervision. The results of this investigation are based solely on the test sample(s) provided by the client which were not adjusted, modified or altered in any manner whatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance with ISO/IEC 17025.	 Art Voss, P.Eng. Technical Manager Celltech Labs Inc. 26 August 2016 Date 

4.0 SCOPE

Scope
This report outlines the measurements made and results collected during electromagnetic emissions testing of the: **AWIRE Technology Corp.: Stealth-AW1001** The measurement results were applied against the applicable EMC requirements and limits outlined in the technical rules and regulations set forth in: **Federal Communication's Commission Code of Federal Regulations Title 47 Part 2 and Part 95 Subpart A and Subpart B.** **Inovation, Science and Economic Development Canada RSS-Gen and RSS-210 Annex 6** Note: This device uses a pre-approved BlueTooth transmitter module: **FCC ID: X3ZBTMOD8** **IC ID: 8828A-MOD8**

5.0 NORMATIVE REFERENCES

Normative References	
ANSI / ISO 17025:2005	General Requirements for competence of testing and calibration laboratories
IEEE/ANSI C63.4:2014	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-D	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 Service
Subpart A:	General Mobile Radio Service (GMRS)
Subpart B:	Family Radio Service (FRS)
RSS-GEN	General Requirements for Compliance of Radio Apparatus
RSS-210	License-exempt Radio Apparatus (All Frequency Bands): Category 1 Equipment
Annex 6:	Family Radio Service (FRS) and General Mobile Radio Service (GMRS)

6.0 FACILITIES AND ACCREDITATIONS

Facility and Accreditation
The facilities used to evaluate this device 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 the FCC under Test Firm Registration Number 714830 and Industry Canada under Test Site File Number IC 3874A-1. Celltech is accredited to ISO 17025, through accrediting body A2LA and with certificate 2470.01.

7.0 CLIENT AND DEVICE INFORMATION

Client Information		
Applicant Name	AWIRE Technology Corporation	
Applicant Address	41099 Circle 5 Estates	
	Calgary, Alberta, T3Z 2T4	
	Canada	
DUT Information		
Device Identifier(s):	**FCC ID:**	2AIGO-AW1001
	IC:	21479-AW1001
Modular Device Identifier(s):	**FCC ID:**	X3ZBTMOD8
	IC:	8828A-MOD8
Device Type:	Portable UHF FRS/GMRS FM Transceiver	
Type of Equipment:	Portable Push-To-Talk (PTT) Radio Transceiver	
Device Model(s) / HVIN:	Stealth-AW1001	
Device Marketing Name / PMN:	Stealth-AW1001	
Firmware Version ID Number / FVIN:	n/a	
Host Marketing Name / HMN:	n/a	
Test Sample Serial No.:	Identical Prototype - Multiple Samples	
Transmit Frequency Range:	FRS: 462.5625 - 462.7125MHz, 467.5625 - 467.7125MHz	
	GMRS: 462.5625 - 462.7125MHz	
	BlueTooth: 2400MHz	
Number of Channels:	FRS: Ch 1-14, GMRS: Ch 2-14 Even Channel Numbers	
Manuf. Max. Rated Output Power:	FRS: 0.5W, GMRS: 0.6W, BlueTooth: 12dBm (16mW)	
Manuf. Max. Rated BW/Data Rate:	n/a	
Emission Type	F3E	
Antenna Gain:	n/a	
Antenna Type:	Internal PCB Trace	
Modulation:	FRS/GMRS: FM, BlueTooth: DQPSK	
Duty Cycle:	FRS/GMRS: 50% PTT Duty Cycle	
DUT Power Source:	Li-Ion Battery	
Deviation(s) from standard/procedure:	None	
Modification of DUT:	None	

APPENDIX A – CONDUCTED POWER

Test Conditions	
Normative Reference	FCC 47 CFR §2.1046, §95.639, RSS-210 A6.1.4, A6.2.4

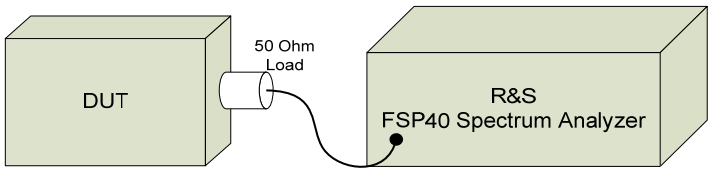
Limits	
47 CFR §95.639	GMRS: 50W, FRS: 0.5W
RSS-210 A6.1.4, A6.2.4	GMRS: 5.0W, FRS: 0.5W

Environmental Conditions (Typical)	
Temperature	25°C
Humidity	<60%
Barometric Pressure	101 +/- 3kPa

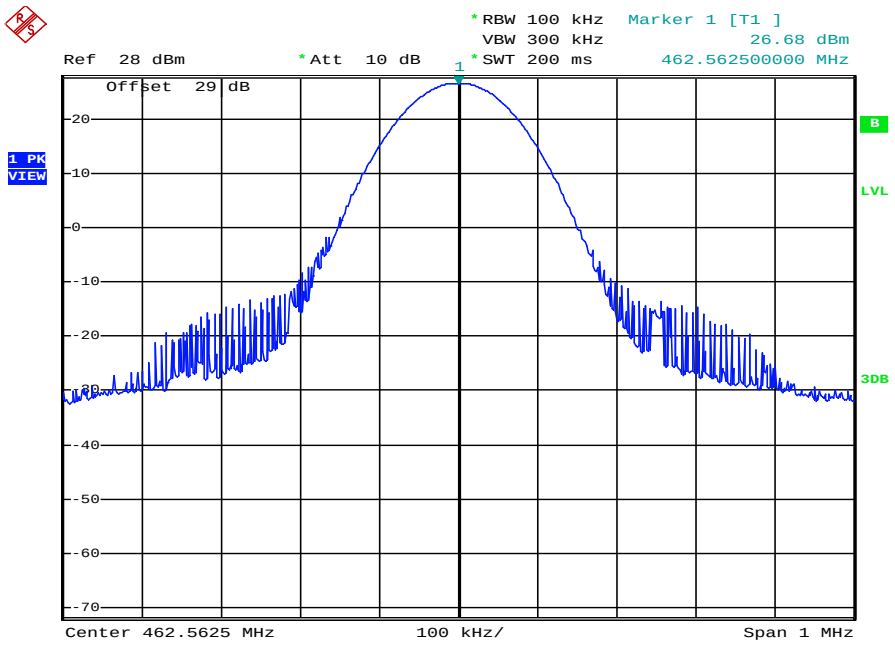
Equipment List

Asset Number	Manufacturer	Model Number	Description
00241	R&S	FSU40	Spectrum Analyzer

Set-Up Drawing



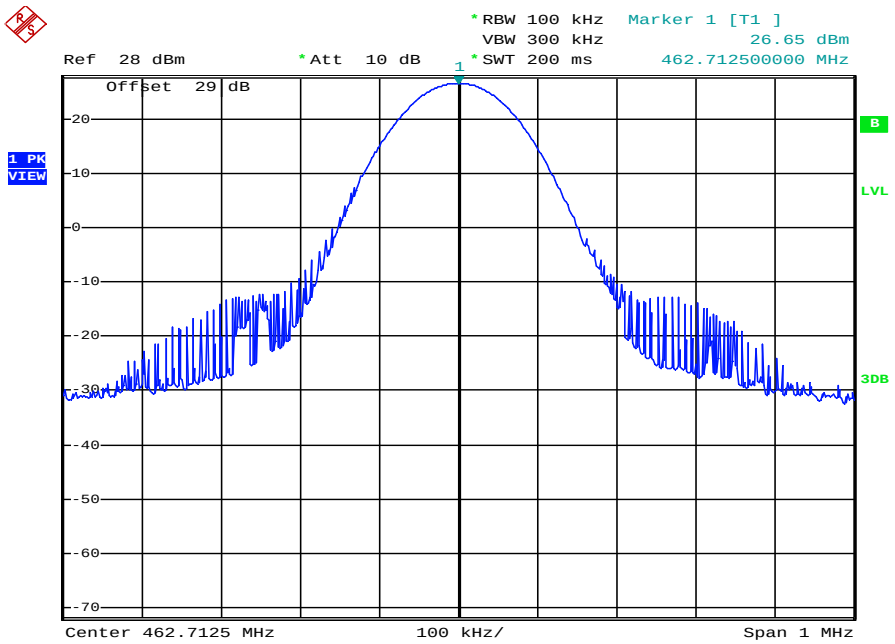
Peak Carrier Conducted Power



Plot for Reference Only

Channel:	FRS Channel 1
Channel Frequency (MHz):	462.5625
Modulation:	CW
Peak Power (dBm):	26.7

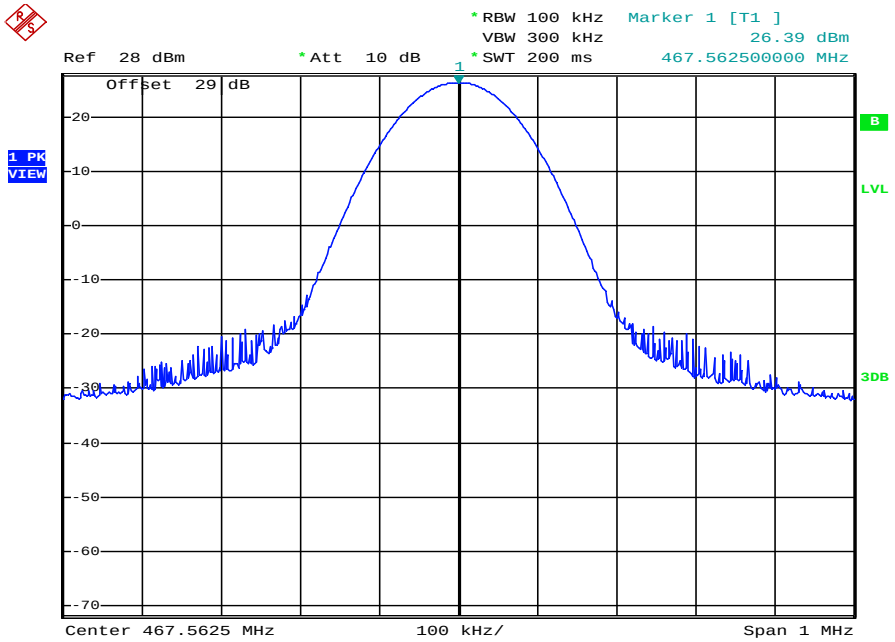
Peak Carrier Conducted Power



Plot for Reference Only

Channel:	FRS Channel 7
Channel Frequency (MHz):	462.7125
Modulation:	CW
Peak Power (dBm):	26.7

Peak Carrier Conducted Power



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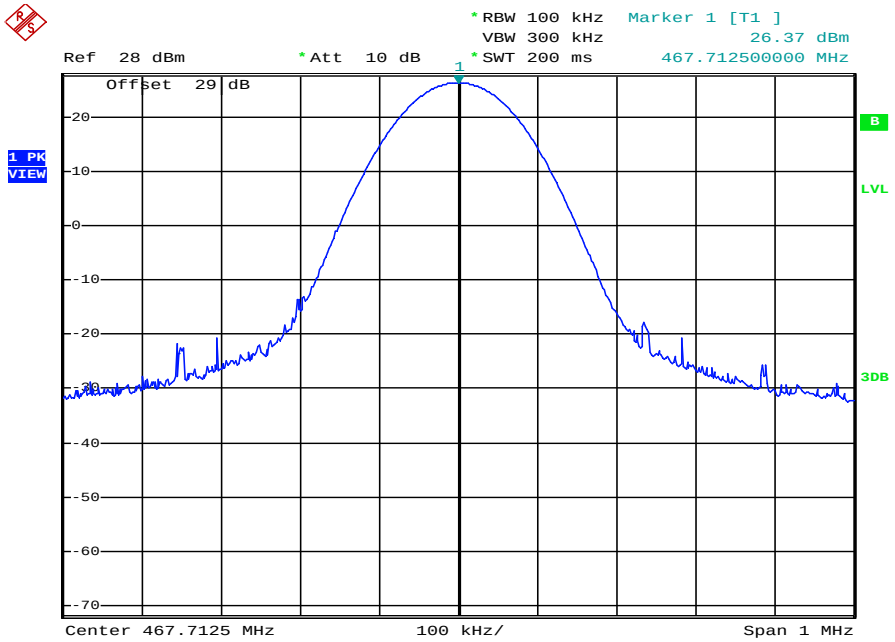
Plot for Reference Only

Channel:	FRS Channel 8
Channel Frequency (MHz):	467.5625
Modulation:	CW
Peak Power (dBm):	26.4

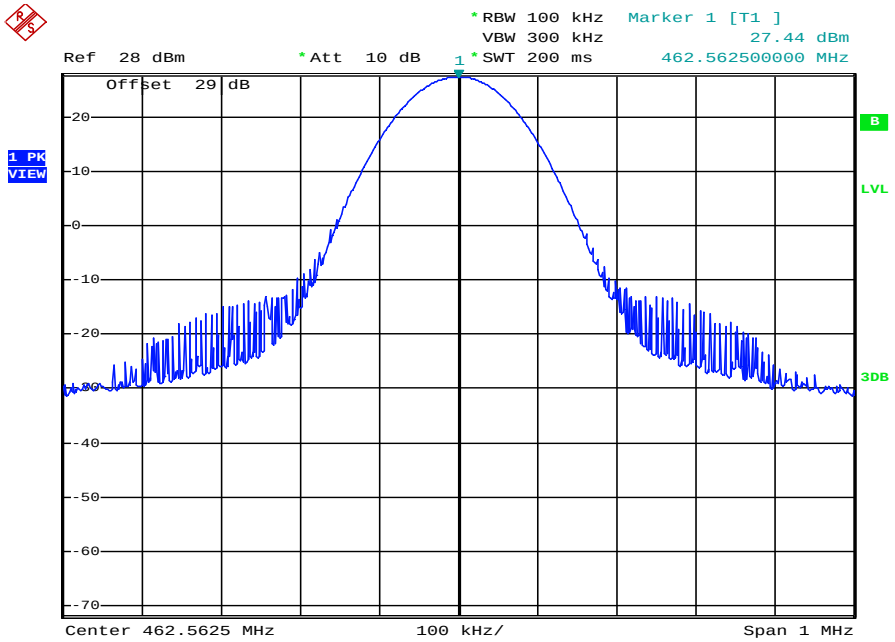
Peak Carrier Conducted Power



Plot for Reference Only

Channel:	FRS Channel 14
Channel Frequency (MHz):	467.7125
Modulation:	CW
Peak Power (dBm):	26.4

Peak Carrier Conducted Power



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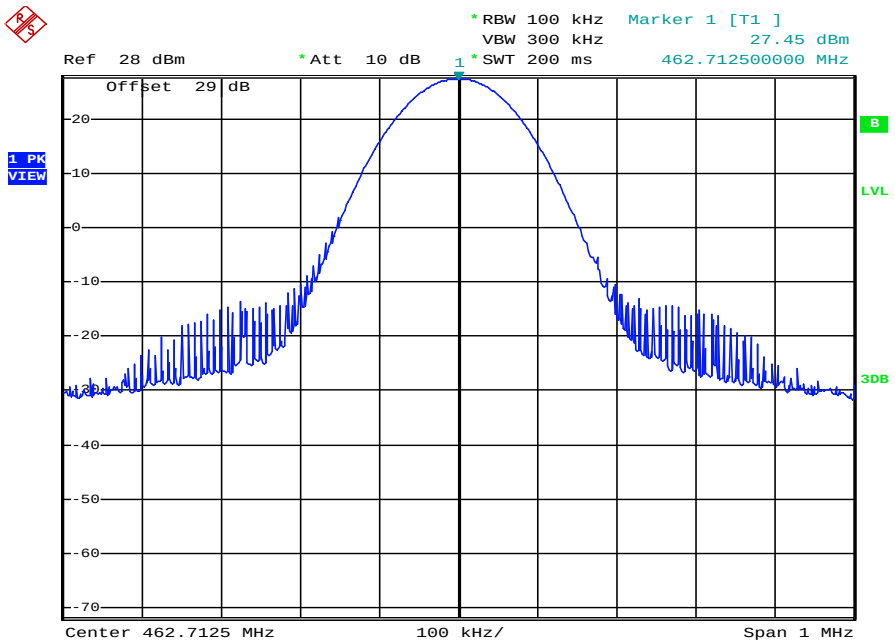
Plot for Reference Only

Channel:	GMRS Channel 2
Channel Frequency (MHz):	462.5625
Modulation:	CW
Peak Power (dBm):	27.4

Peak Carrier Conducted Power



Date: 23.JUN.2016 12:52:11

Plot for Reference Only

Channel:	GMRS Channel 14
Channel Frequency (MHz):	462.5625
Modulation:	CW
Peak Power (dBm):	27.5

§95.639(d), RSS-210 A6.1.4					Peak Output Power of Fundemental (Carrier) - FRS					
FRS Channel	Freq (MHz)	[P_{Meas}] (dBm)	Antenna Gain* [G_T] (dBi)	Cable Loss* [L_C] (dB)	ERP (dBm)	ERP (W)	Limit (dBm)	Limit (W)	Margin (dB)	Margin (W)
1	462.5625	26.7	0	0	26.7	0.47	27	0.50	0.30	0.03
7	462.7125	26.7	0	0	26.7	0.47	27	0.50	0.30	0.03
8	467.5625	26.4	0	0	26.4	0.44	27	0.50	0.60	0.06
14	467.7125	26.4	0	0	26.4	0.44	27	0.50	0.60	0.06

$ERP = P_{Meas} + G_T - L_C$
Margin = Limit - ERP
* Antenna Gain and Cable Loss assumed at 0dB

Result: **Complies**

§95.639(a)					Peak Output Power of Fundemental (Carrier) - GMRS					
GMRS Channel	Freq (MHz)	[P_{Meas}] (dBm)	Antenna Gain* [G_T] (dBi)	Cable Loss* [L_C] (dB)	ERP (dBm)	ERP (W)	Limit** (dBm)	Limit** (W)	Margin (dB)	Margin (W)
2	462.5625	27.4	0	0	27.4	0.55	47	50.00	19.60	49.45
14	462.7125	27.5	0	0	27.5	0.56	47	50.00	19.50	49.44

$ERP = P_{Meas} + G_T - L_C$
Margin = Limit - ERP
* Antenna Gain and Cable Loss assumed at 0dB
Average TP during one unmodulated RF cycle, Emission type **F3E

Result: **Complies**

RSS-210 A6.2.4					Peak Output Power of Fundemental (Carrier) - GMRS					
GMRS Channel	Freq (MHz)	[P_{Meas}] (dBm)	Antenna Gain* [G_T] (dBi)	Cable Loss* [L_C] (dB)	ERP (dBm)	ERP (W)	Limit (dBm)	Limit (W)	Margin (dB)	Margin (W)
2	462.5625	27.4	0	0	27.4	0.55	33	2.00	5.60	1.45
14	462.7125	27.5	0	0	27.5	0.56	33	2.00	5.50	1.44

$ERP = P_{Meas} + G_T - L_C$
Margin = Limit - ERP
* Antenna Gain and Cable Loss assumed at 0dB

Result: **Complies**

APPENDIX B – MODULATION CHARACTERISTICS

Test Conditions	
Normative Reference	FCC 47 CFR §2.1047, §95.637, RSS-210 A6

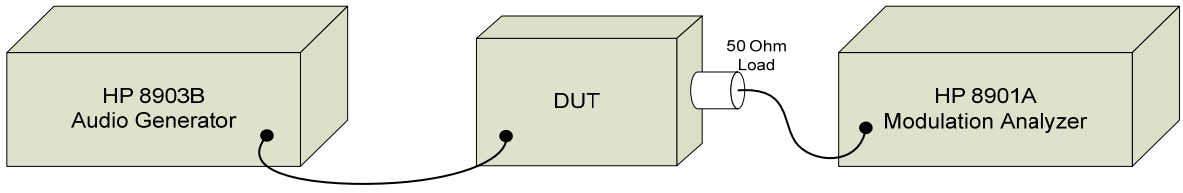
Limits	
FCC §2.1047	a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted.
FCC §95.637 RSS-210 A6.1.2, A6.2.2	a) A GMRS transmitter that transmit emission type F3E must not exceed a peak frequency deviation of +/- 5kHz. 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
	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 log10 (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.

Environmental Conditions (Typical)	
Temperature	25°C
Humidity	<60%
Barometric Pressure	101 +/- 3kPa

Equipment List

Asset Number	Manufacturer	Model Number	Description
00028	HP	8901A	Modulation Analyzer
00027	HP	8903B	Audio Generator

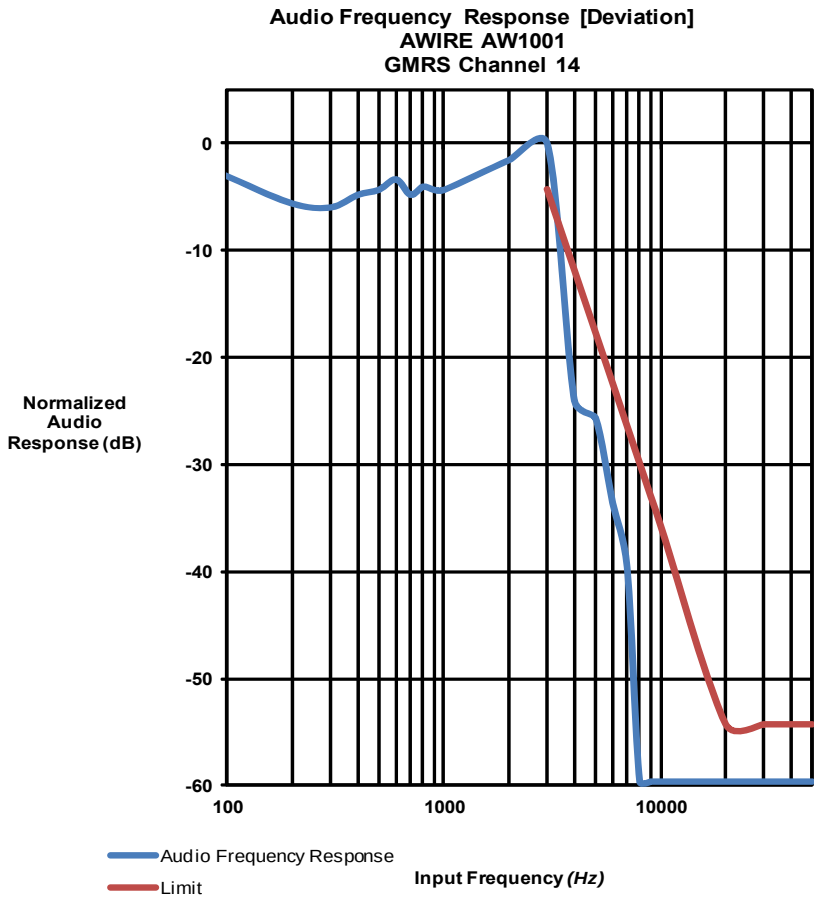
Set-Up Drawing



§95.637, RSS-210 A6.2.2 — Audio Frequency Response (GMRS)

Measured Audio Response		
Freq (Hz)	Audio Response (Deviation) (kHz)	(dB)*
30	0.250	-11.596
40	0.400	-7.513
50	0.650	-3.296
60	0.600	-3.991
70	0.670	-3.033
80	0.700	-2.653
90	0.700	-2.653
100	0.670	-3.033
200	0.500	-5.575
300	0.480	-5.930
400	0.550	-4.747
500	0.580	-4.286
600	0.650	-3.296
700	0.550	-4.747
800	0.600	-3.991
900	0.580	-4.286
1000	0.580	-4.286
2000	0.800	-1.493
3000	0.950	0.000
4000	0.060	-23.991
5000	0.050	-25.575
6000	0.020	-33.534
7000	0.010	-39.554
8000	0.001	-59.554
9000	0.001	-59.554
10000	0.001	-59.554
20000	0.001	-59.554
30000	0.001	-59.554
40000	0.001	-59.554
50000	0.001	-59.554

*** Normalize to 3000Hz**



Audio Input: 500mV

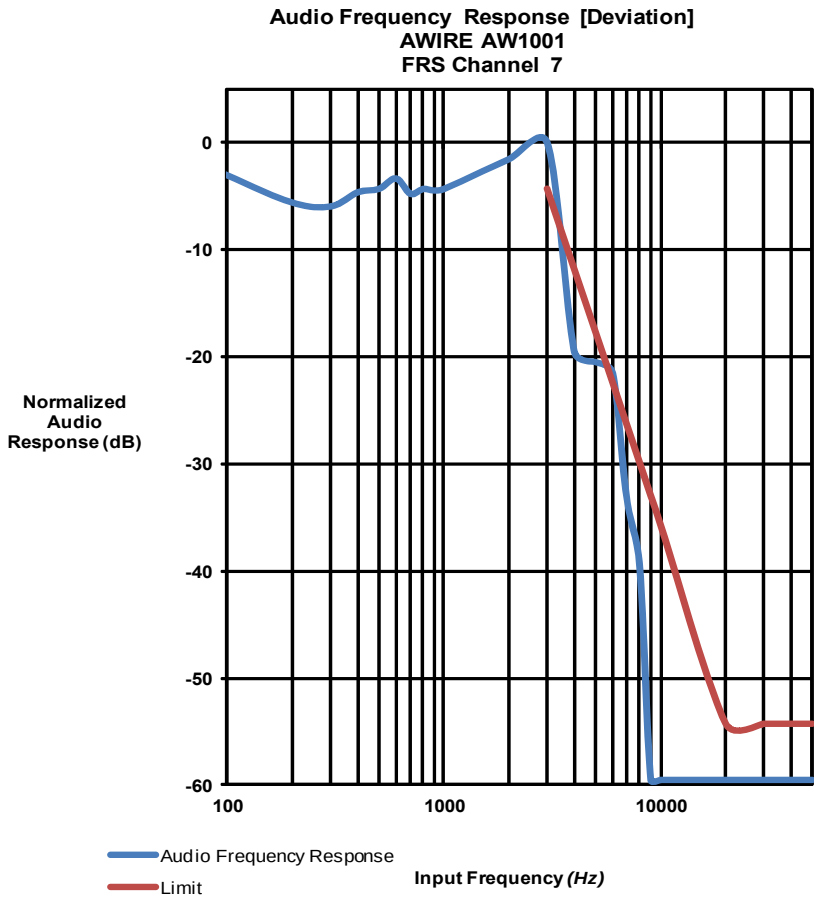
Modulation Type:	F3E
Maximum Modulation Deviation (kHz):	± 0.95
Maximum Modulation Deviation Limit [47 CFR §95.637(a)] (kHz):	± 5.0
Maximum Modulation Deviation Limit [RSS-210 A6.2.2] (kHz):	± 5.0
Result:	Complies

§95.637, RSS-210 A6.1.2 — Audio Frequency Response (FRS)

Measured Audio Response		
Freq (Hz)	Audio Response (Deviation) (kHz)	(dB)*
30	0.250	-11.596
40	0.400	-7.513
50	0.640	-3.431
60	0.610	-3.848
70	0.680	-2.904
80	0.700	-2.653
90	0.700	-2.653
100	0.670	-3.033
200	0.500	-5.575
300	0.480	-5.930
400	0.560	-4.591
500	0.580	-4.286
600	0.650	-3.296
700	0.550	-4.747
800	0.580	-4.286
900	0.570	-4.437
1000	0.580	-4.286
2000	0.800	-1.493
3000	0.950	0.000
4000	0.100	-19.554
5000	0.090	-20.470
6000	0.080	-21.493
7000	0.020	-33.534
8000	0.010	-39.554
9000	0.001	-59.554
10000	0.001	-59.554
20000	0.001	-59.554
30000	0.001	-59.554
40000	0.001	-59.554
50000	0.001	-59.554

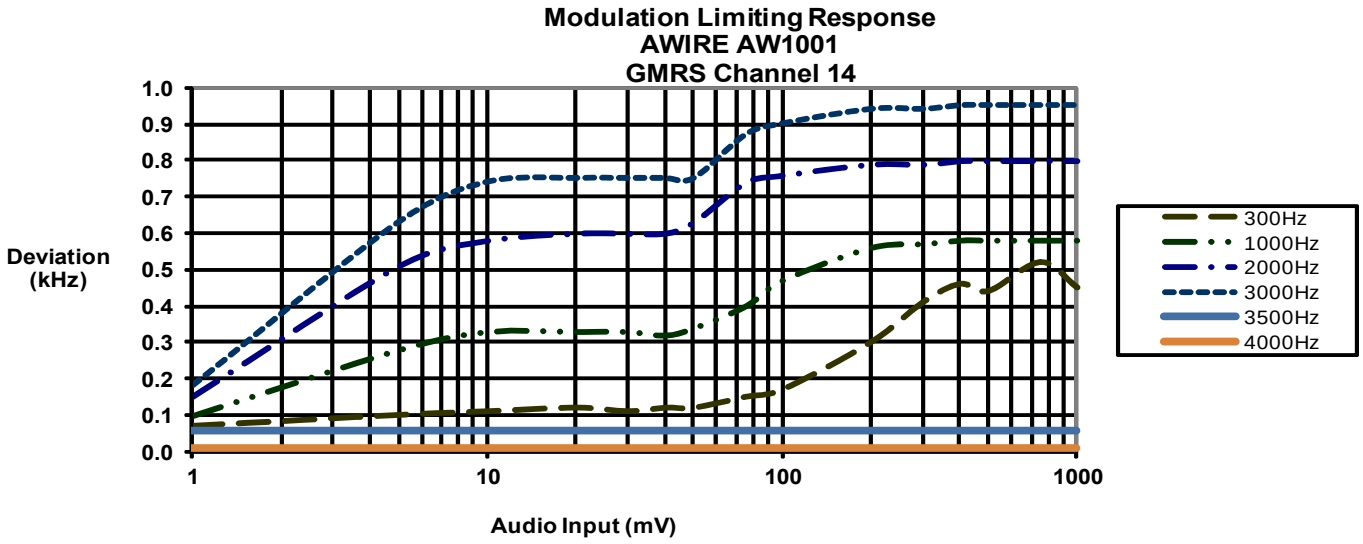
*** Normalize to 3000Hz**

Audio Input: 500mV



Modulation Type:	F3E
Maximum Modulation Deviation (kHz):	± 0.95
Maximum Modulation Deviation Limit [47 CFR §95.637(a)] (kHz):	± 2.5
Maximum Modulation Deviation Limit [RSS-210 A6.1.2(c)] (kHz):	± 5.0
Result:	Complies

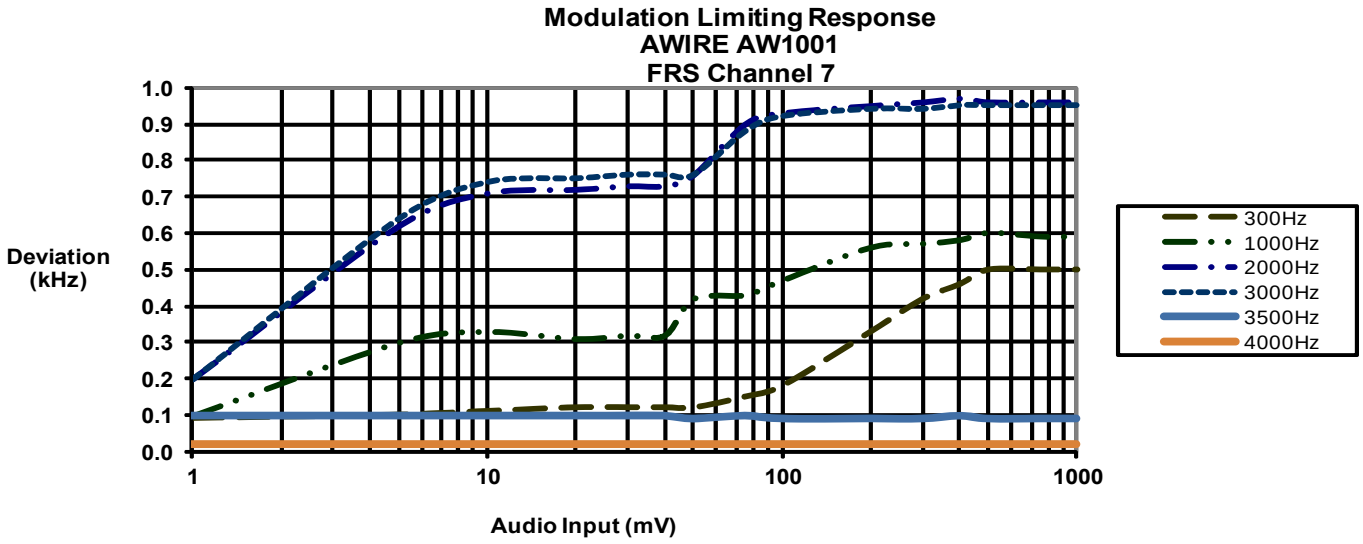
Modulation Limiting Response (GMRS)



Measured Modulation Response [Deviataion (kHz)]															
Freq (Hz)	1	5	10	20	30	40	50	75	100	200	300	400	500	750	1000
300	0.07	0.10	0.11	0.12	0.11	0.12	0.12	0.15	0.17	0.30	0.41	0.46	0.44	0.52	0.45
1000	0.10	0.28	0.33	0.33	0.33	0.32	0.34	0.40	0.47	0.56	0.57	0.58	0.58	0.58	0.58
2000	0.15	0.51	0.58	0.60	0.60	0.60	0.63	0.74	0.76	0.79	0.79	0.80	0.80	0.80	0.80
3000	0.18	0.63	0.74	0.75	0.75	0.75	0.75	0.87	0.90	0.94	0.94	0.95	0.95	0.95	0.95
3500	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
4000	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Audio Frequency @ Maximum Deviation (kHz):	3000
Audio Input @ Maximum Deviation (mV):	400
Maximum Measured Deviation (kHz):	0.95
Maximum Modulation Deviation Limit [47 CFR §95.637(a)] (kHz):	5.00
Maximum Modulation Deviation Limit [RSS-210 A6.2.2] (kHz):	5.00
Result:	Complies

Modulation Limiting Response (FRS)

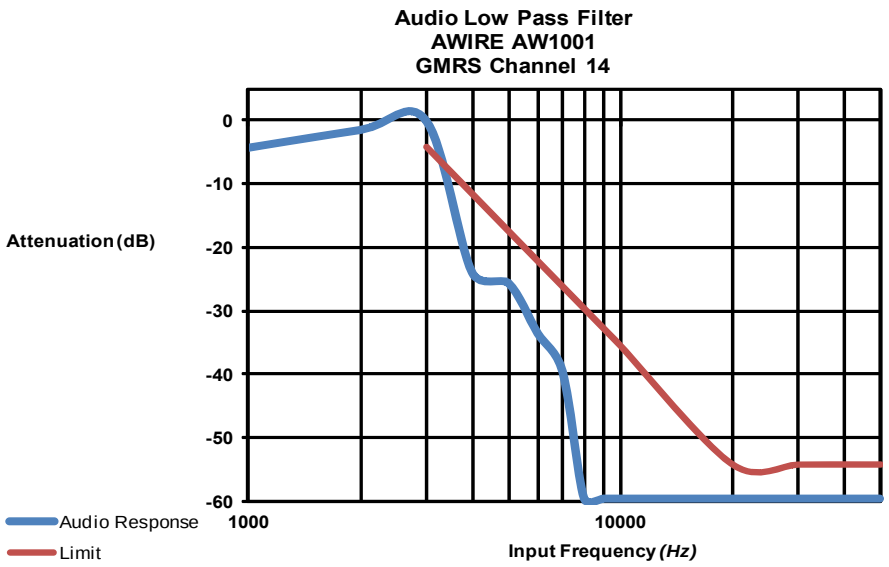


Measured Modulation Response [Deviataion (kHz)]															
Freq (Hz)	1	5	10	20	30	40	50	75	100	200	300	400	500	750	1000
300	0.09	0.10	0.11	0.12	0.12	0.12	0.12	0.15	0.18	0.33	0.42	0.46	0.50	0.50	0.50
1000	0.10	0.30	0.33	0.31	0.32	0.32	0.42	0.43	0.47	0.56	0.57	0.58	0.60	0.59	0.59
2000	0.20	0.62	0.71	0.72	0.73	0.73	0.76	0.90	0.93	0.95	0.96	0.97	0.96	0.96	0.96
3000	0.20	0.64	0.74	0.75	0.76	0.76	0.76	0.88	0.92	0.94	0.94	0.95	0.95	0.95	0.95
3500	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.10	0.09	0.09	0.09	0.10	0.09	0.09	0.09
4000	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Audio Frequency @ Maximum Deviation (kHz):	2000
Audio Input @ Maximum Deviation (mV):	400
Maximum Measured Deviation (kHz):	0.97
Maximum Modulation Deviation Limit [47 CFR §95.637(a)] (kHz):	2.50
Maximum Modulation Deviation Limit [RSS-210 A6.1.2(c)] (kHz):	2.50
Result:	Complies

§95.637, RSS-210 A6.2.2 — Low Pass Frequency Response (GMRS)

Measured Audio Response		
Freq (Hz)	Audio Response (Deviation) (kHz)	(dB)*
1000	0.580	-4.286
2000	0.800	-1.493
3000	0.950	0.000
4000	0.060	-23.991
5000	0.050	-25.575
6000	0.020	-33.534
7000	0.010	-39.554
8000	0.001	-59.554
9000	0.001	-59.554
10000	0.001	-59.554
20000	0.001	-59.554
30000	0.001	-59.554
40000	0.001	-59.554
50000	0.001	-59.554
*Normalized to 3000Hz		

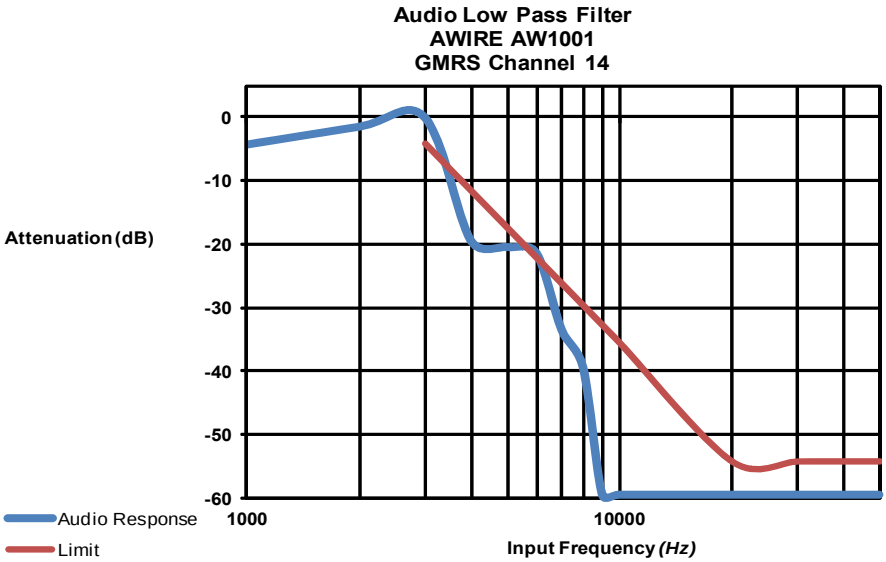


Audio Input: 500mV

Modulation Type:	F3E
Limit: 3kHz ≤ f ≤ 20kHz, 60Log10(f/3) > Attenuation @ 1kHz	-
Limit: f ≥ 20kHz, 50 > Attenuation @ 1kHz	-54.3 dB
Result:	Complies

§95.637, RSS-210 A6.1.2 — Low Pass Frequency Response (GMRS)

Measured Audio Response		
Freq (Hz)	Audio Response (Deviation) (kHz)	(dB)*
1000	0.580	-4.286
2000	0.800	-1.493
3000	0.950	0.000
4000	0.100	-19.554
5000	0.090	-20.470
6000	0.080	-21.493
7000	0.020	-33.534
8000	0.010	-39.554
9000	0.001	-59.554
10000	0.001	-59.554
20000	0.001	-59.554
30000	0.001	-59.554
40000	0.001	-59.554
50000	0.001	-59.554
*Normalized to 3000Hz		



Audio Input: 500mV

Modulation Type:	F3E
Cut-Off Frequency @ > -6dB (kHz):	3.0
Limit [47 CFR §95.637(a)] (kHz):	3.125
Result:	Complies

APPENDIX C – OCCUPIED BANDWIDTH

Test Conditions	
Normative Reference	FCC 47 CFR §2.1049, §95.633, RSS-210 A6

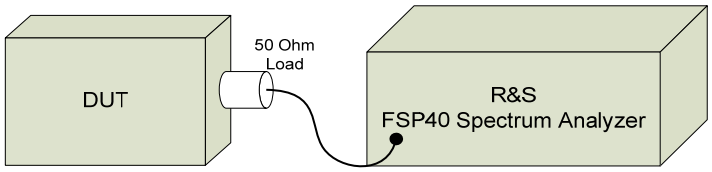
Limits	
47 CFR §2.1049	The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured…

Environmental Conditions (Typical)	
Temperature	25°C
Humidity	<60%
Barometric Pressure	101 +/- 3kPa

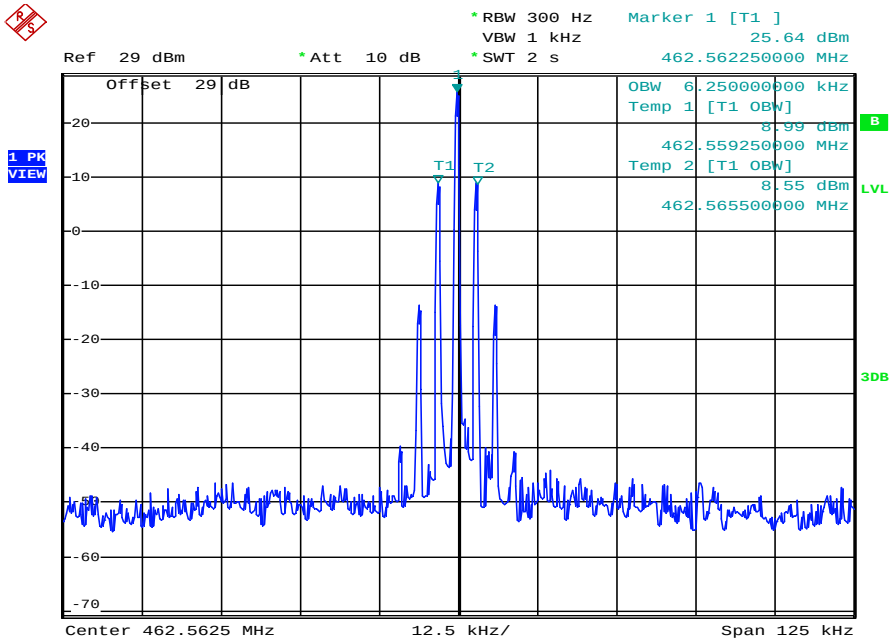
Equipment List

Asset Number	Manufacturer	Model Number	Description
00241	R&S	FSU40	Spectrum Analyzer

Set-Up Drawing



§95.633, RSS-210 A6.1.3 — Occupied Bandwidth

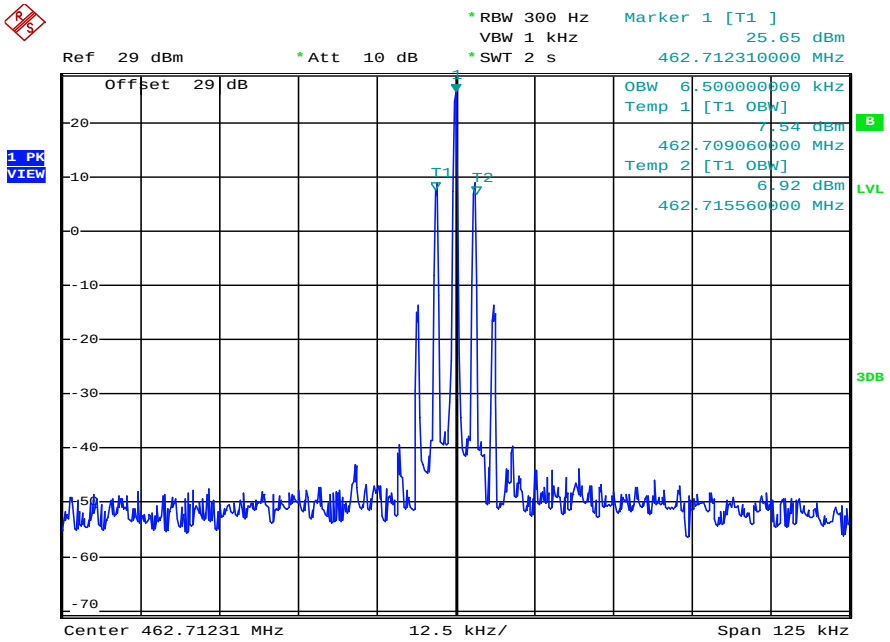


Date: 23.JUN.2016 14:32:43

Plot for Reference Only

Channel:	FRS Channel 1
Channel Frequency (MHz):	462.5625
Modulation:	FM (3kHz)
Measured Occupied Bandwidth (99%) (kHz):	6.25
Authorized Bandwidth (kHz):	12.50
Result:	**Complies**

§95.633, RSS-210 A6.1.3 — Occupied Bandwidth

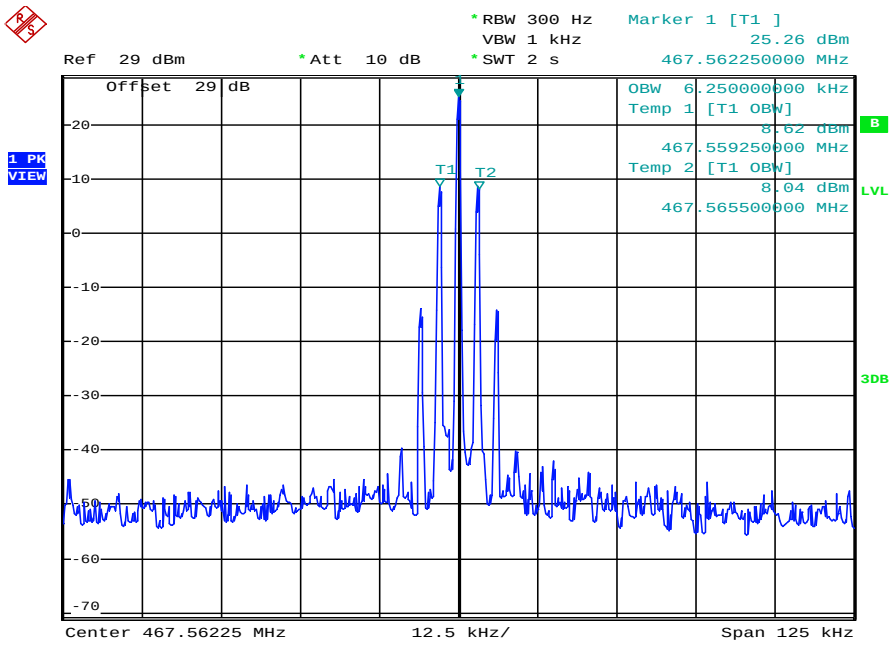


Date: 23.JUN.2016 14:34:11

Plot for Reference Only

Channel:	FRS Channel 7
Channel Frequency (MHz):	462.7125
Modulation:	FM (3kHz)
Measured Occupied Bandwidth (99%) (kHz):	6.50
Authorized Bandwidth (kHz):	12.50
Result:	**Complies**

§95.633, RSS-210 A6.1.3 — Occupied Bandwidth

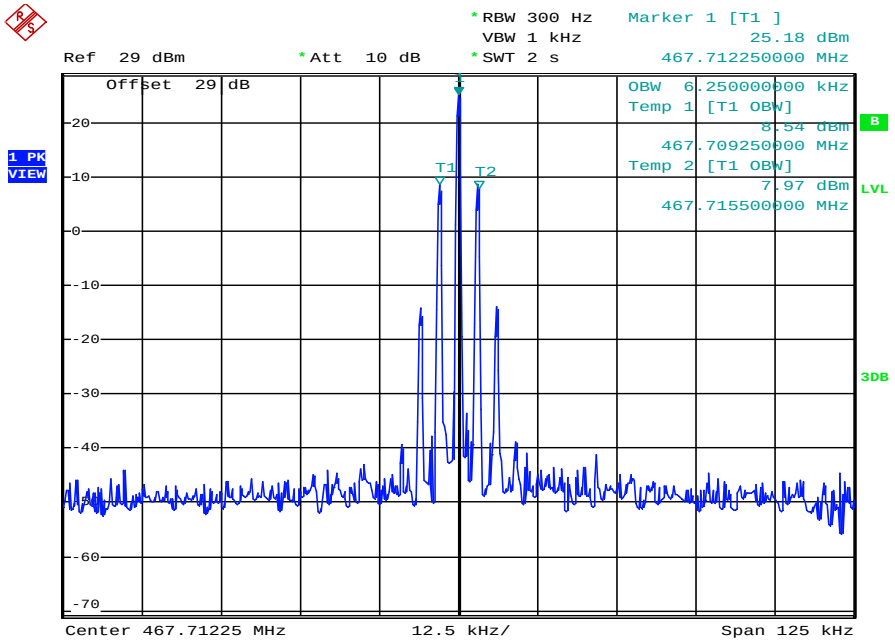


Date: 23.JUN.2016 14:35:15

Plot for Reference Only

Channel:	FRS Channel 8
Channel Frequency (MHz):	467.5625
Modulation:	FM (3kHz)
Measured Occupied Bandwidth (99%) (kHz):	6.25
Authorized Bandwidth (kHz):	12.50
Result:	**Complies**

§95.633, RSS-210 A6.1.3 — Occupied Bandwidth

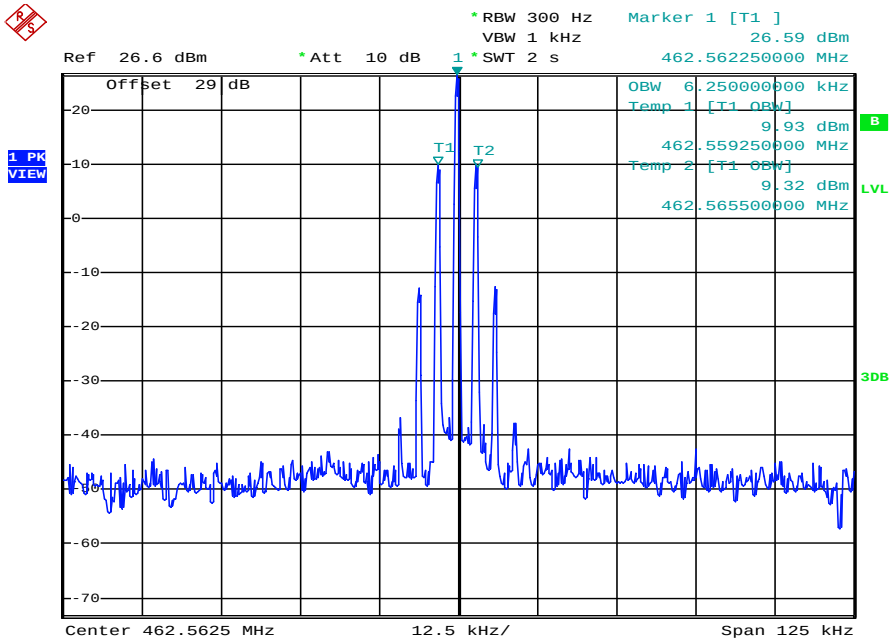


Date: 23.JUN.2016 14:36:11

Plot for Reference Only

Channel:	FRS Channel 14
Channel Frequency (MHz):	467.7125
Modulation:	FM (3kHz)
Measured Occupied Bandwidth (99%) (kHz):	6.25
Authorized Bandwidth (kHz):	12.50
Result:	**Complies**

§95.633, RSS-210 A6.2.3 — Occupied Bandwidth

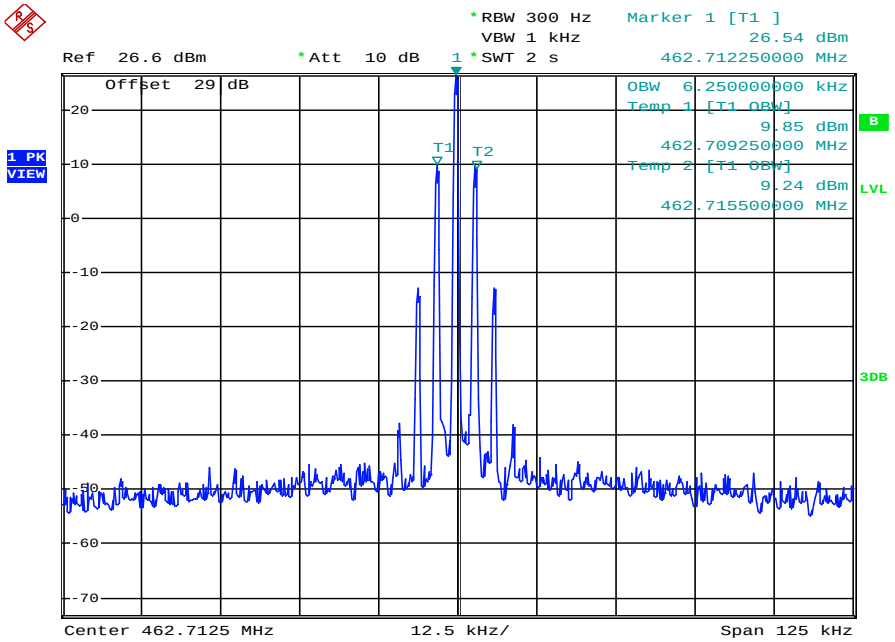


Date: 23.JUN.2016 14:20:34

Plot for Reference Only

Channel:	GMRS Channel 2
Channel Frequency (MHz):	462.5625
Modulation:	FM (3kHz)
Measured Occupied Bandwidth (99%) (kHz):	6.25
Authorized Bandwidth (kHz):	20.00
Result:	**Complies**

§95.633, RSS-210 A6.2.3 — Occupied Bandwidth



Date: 23.JUN.2016 14:21:44

Plot for Reference Only

Channel:	GMRS Channel 14
Channel Frequency (MHz):	462.7125
Modulation:	FM (3kHz)
Measured Occupied Bandwidth (99%) (kHz):	6.50
Authorized Bandwidth (kHz):	20.00
Result:	**Complies**

APPENDIX D – EMISSION MASKS

Test Conditions	
Normative Reference	FCC 47 CFR §2.1051, §95.635, RSS-210 A6.1.5, A6.2.5
Procedure Reference	ANSI/TIA/EIA-603-D, ANSI C63.4

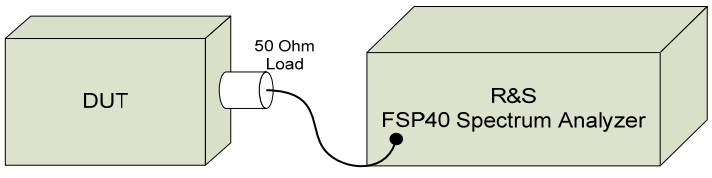
Limits	
With Filtering 47 CFR §95.635 RSS-210 A6.1.5, A6.2.5	(1) 25 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 50%, up to and including 100% of the authorized bandwidth (3) 35 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 100%, up to and including 250% of the authorized bandwidth (7) 43 dB + 10 log10(carrier power in watts) dB, measured with a bandwidth of at least 30 kHz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 250% of the authorized bandwidth
Without Filtering 47 CFR §95.635 RSS-210 A6.1.5, A6.2.5	(5)At least 83 log10 (fd/5) dB on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz), of more than 5 kHz up to and including 10 kHz (6) At least 116 log10 (fd/6.1) dB, or if less, 50 + 10 log10 (T) dB, on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz), of more than 10 kHz up to and including 250% of the authorized bandwidth (7) 43 dB + 10 log10(carrier power in watts) dB, measured with a bandwidth of at least 30 kHz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 250% of the authorized bandwidth

Environmental Conditions (Typical)	
Temperature	25°C
Humidity	<60%
Barometric Pressure	101 +/- 3kPa

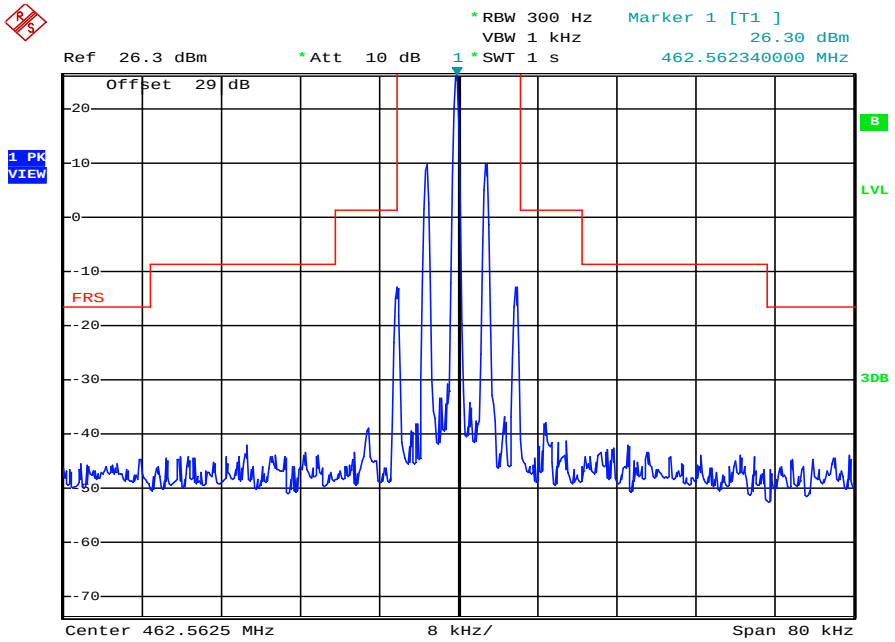
Equipment List

Asset Number	Manufacturer	Model Number	Description
00241	R&S	FSU40	Spectrum Analyzer

Set-Up Drawing



§95.635, RSS-210 A6.1.5 — Emission Mask

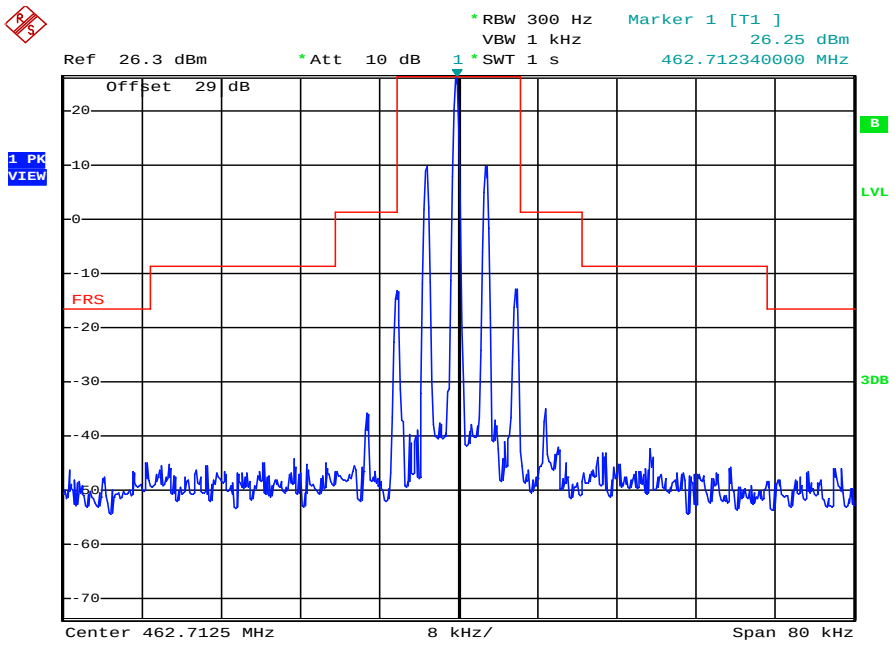


Date: 23.JUN.2016 13:24:56

Plot for Reference Only

Channel:	FRS Channel 1
Channel Frequency (MHz):	462.5625
Modulation:	FM (3kHz)
Result:	**Complies**

§95.635, RSS-210 A6.1.5 — Emission Mask

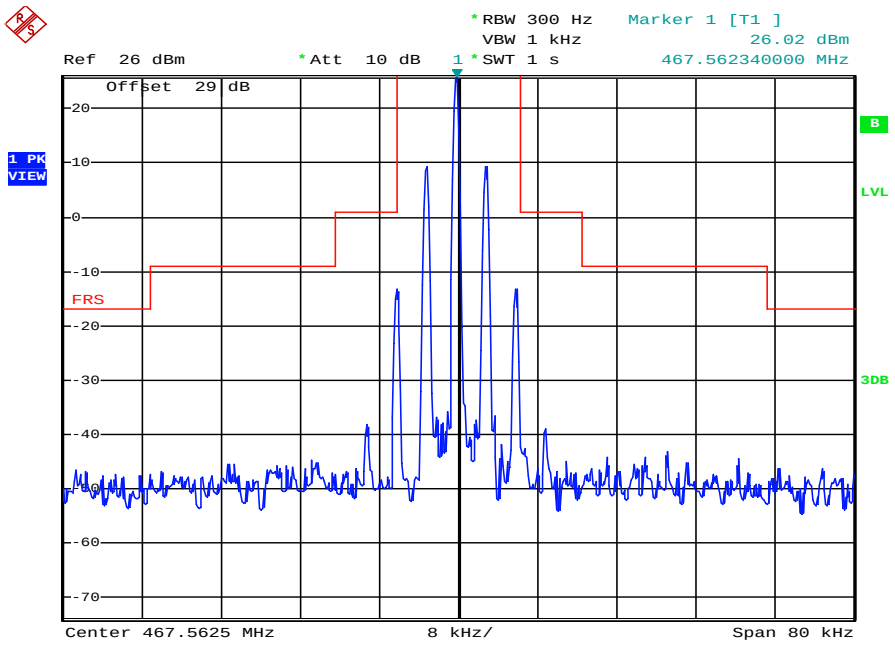


Date: 23.JUN.2016 13:27:41

Plot for Reference Only

Channel:	FRS Channel 7
Channel Frequency (MHz):	462.7125
Modulation:	FM (3kHz)
Result:	**Complies**

§95.635, RSS-210 A6.1.5 — Emission Mask

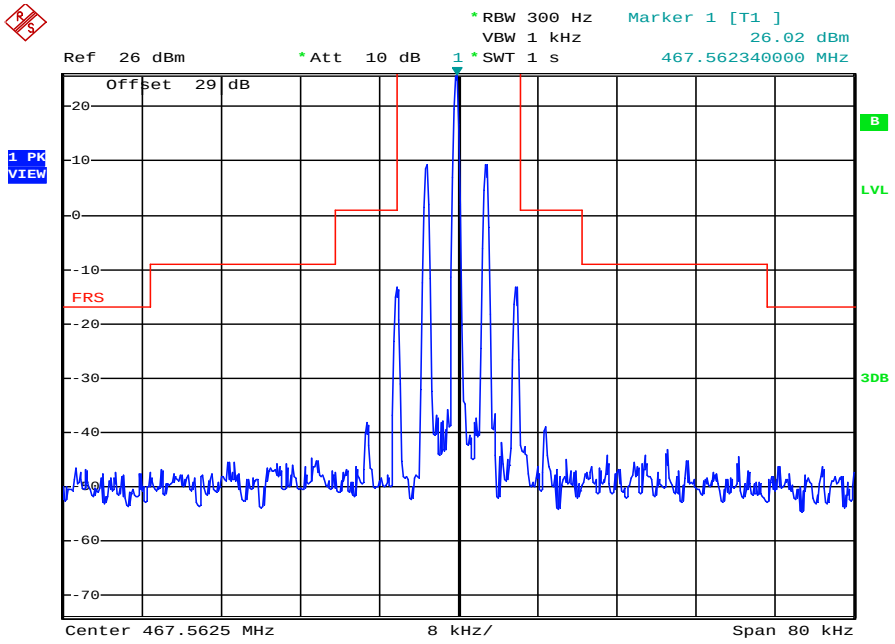


Date: 23.JUN.2016 13:29:09

Plot for Reference Only

Channel:	FRS Channel 8
Channel Frequency (MHz):	467.5625
Modulation:	FM (3kHz)
Result:	**Complies**

§95.635, RSS-210 A6.1.5 — Emission Mask

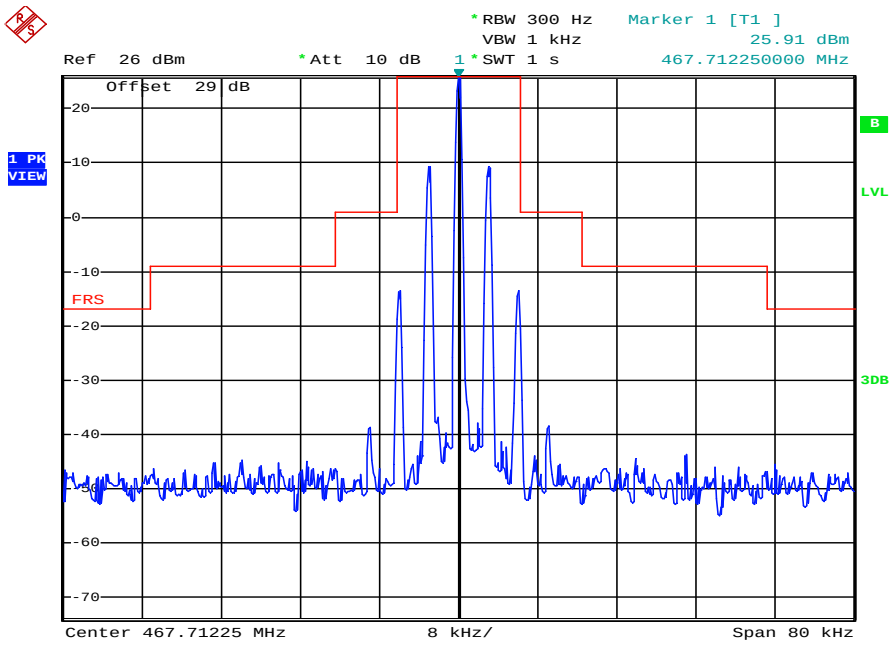


Date: 23.JUN.2016 13:29:09

Plot for Reference Only

Channel:	FRS Channel 8
Channel Frequency (MHz):	467.5625
Modulation:	FM (3kHz)
Result:	**Complies**

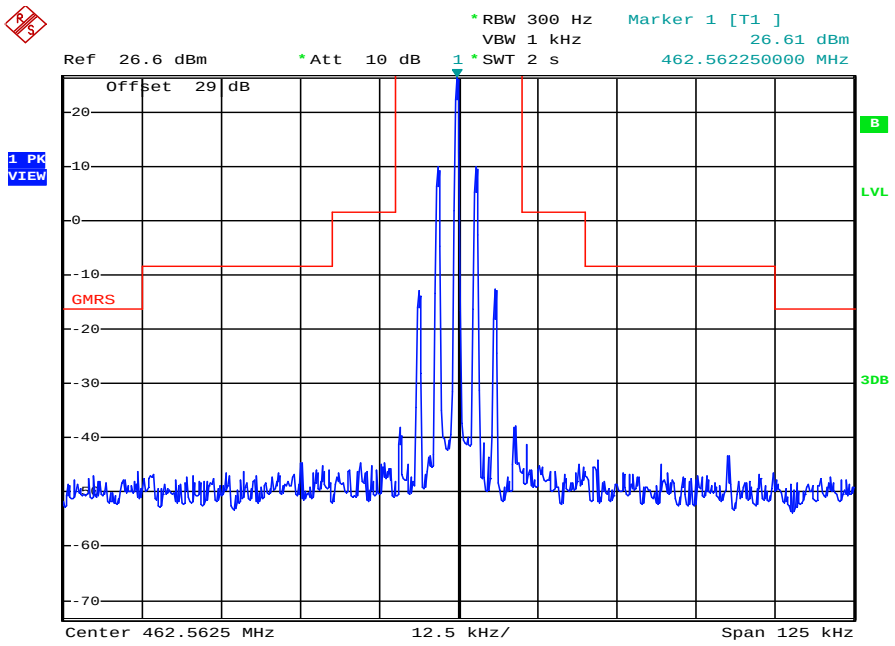
§95.635, RSS-210 A6.1.5 — Emission Mask



Plot for Reference Only

Channel:	FRS Channel 14
Channel Frequency (MHz):	467.7125
Modulation:	FM (3kHz)
Result:	**Complies**

§95.635, RSS-210 A6.2.5(a) — Emission Mask

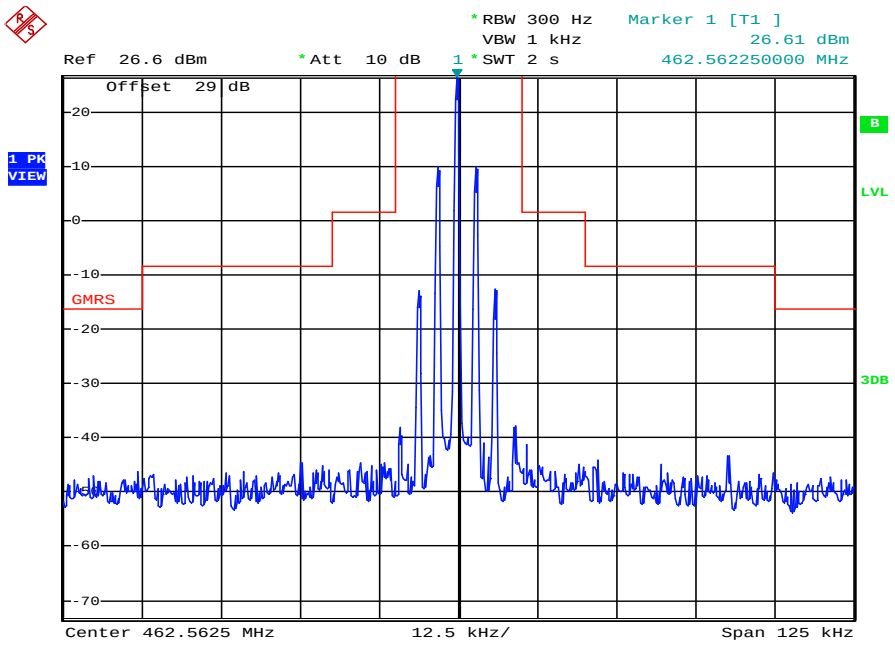


Date: 23.JUN.2016 14:17:54

Plot for Reference Only

Channel:	GMRS Channel 2
Channel Frequency (MHz):	462.5625
Modulation:	FM (3kHz)
Result:	**Complies**

§95.635, RSS-210 A6.2.5(a) — Emission Mask

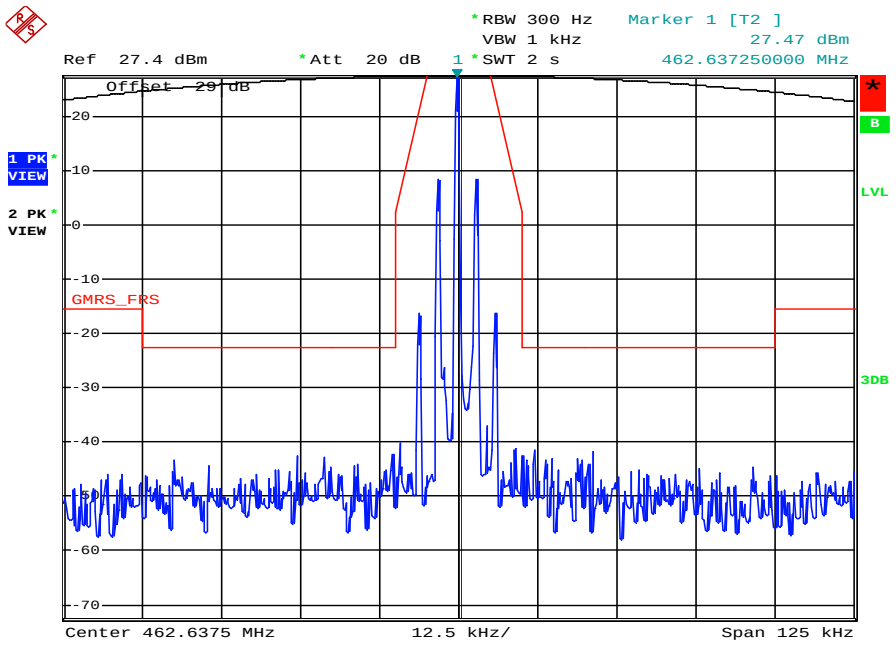


Date: 23.JUN.2016 14:17:54

Plot for Reference Only

Channel:	GMRS Channel 2
Channel Frequency (MHz):	462.5625
Modulation:	FM (3kHz)
Result:	**Complies**

§95.635(b)(5)(6)(7), RSS-210 A6.2.5(b)	Emission Mask



Plot for Reference Only

Channel:	GMRS Channel 8
Channel Frequency (MHz):	462.6375
Modulation:	FM (3kHz)
Result:	**Complies**

The AW1001 utilizes digital audio filter. Functionally, the Low-Pass Filter requirements of §95.637(b) and RSS-210 A6.2.2 are met. However, the response of the digital filter cannot be fully characterized therefore compliance to §95.635(5)(6) & (7) and RSS-210 A6.2.5(b) is demonstrated above.

APPENDIX E – CONDUCTED SPURIOUS EMISSIONS

Test Conditions	
Normative Reference	FCC 47 CFR §2.1051, §95.635, RSS-210 A6.1.5, A6.2.5
Procedure Reference	ANSI/TIA/EIA-603-D, ANSI C63.4

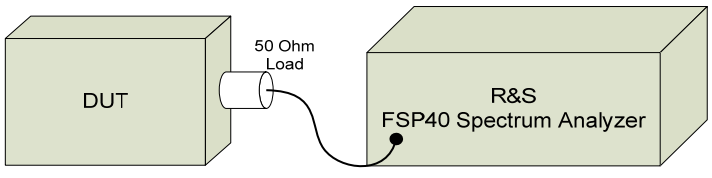
Limits	
With Filtering 47 CFR §95.635 RSS-210 A6.1.5, A6.2.5	(1) 25 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 50%, up to and including 100% of the authorized bandwidth (3) 35 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 100%, up to and including 250% of the authorized bandwidth (7) 43 dB + 10 log10(carrier power in watts) dB, measured with a bandwidth of at least 30 kHz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 250% of the authorized bandwidth
Without Filtering 47 CFR §95.635 RSS-210 A6.1.5, A6.2.5	(5)At least 83 log10 (fd/5) dB on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz), of more than 5 kHz up to and including 10 kHz (6) At least 116 log10 (fd/6.1) dB, or if less, 50 + 10 log10 (T) dB, on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz), of more than 10 kHz up to and including 250% of the authorized bandwidth (7) 43 dB + 10 log10(carrier power in watts) dB, measured with a bandwidth of at least 30 kHz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 250% of the authorized bandwidth

Environmental Conditions (Typical)	
Temperature	25°C
Humidity	<60%
Barometric Pressure	101 +/- 3kPa

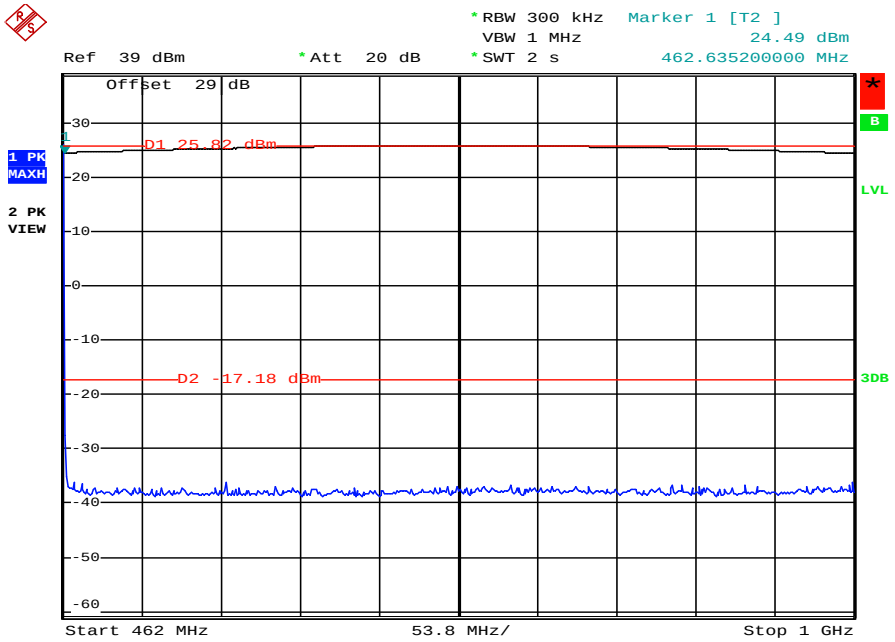
Equipment List

Asset Number	Manufacturer	Model Number	Description
00241	R&S	FSU40	Spectrum Analyzer

Set-Up Drawing



§95.635, RSS-210 A6.1.5 — Conducted Spurious Emissions

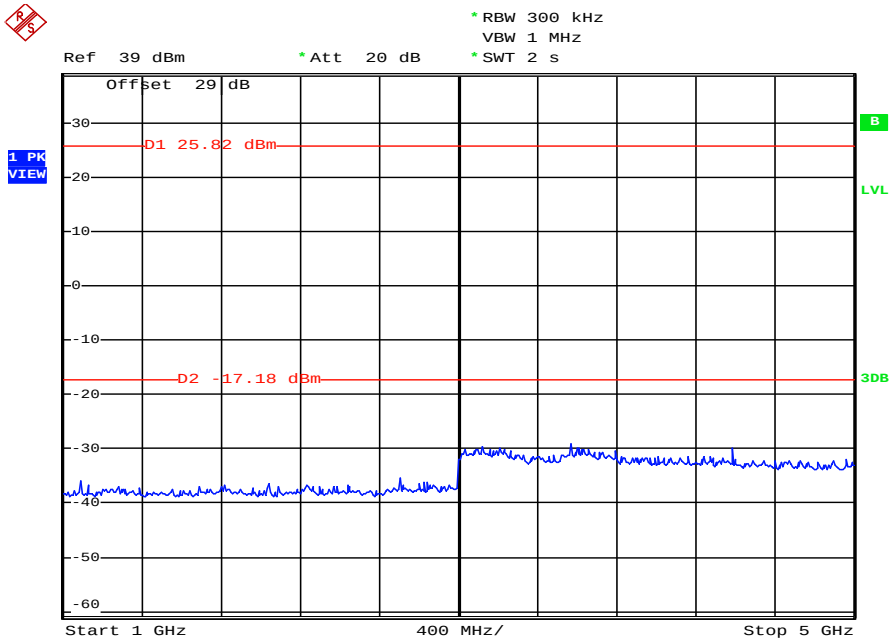


Date: 8.JUL.2016 10:43:21

Plot for Reference Only

Frequency Range (MHz):	462-1000
Channel:	FRS Channel 1
Channel Frequency (MHz):	462.5625
Modulation:	CW
Emission (dBm):	None Detected

§95.635, RSS-210 A6.1.5	Conducted Spurious Emissions

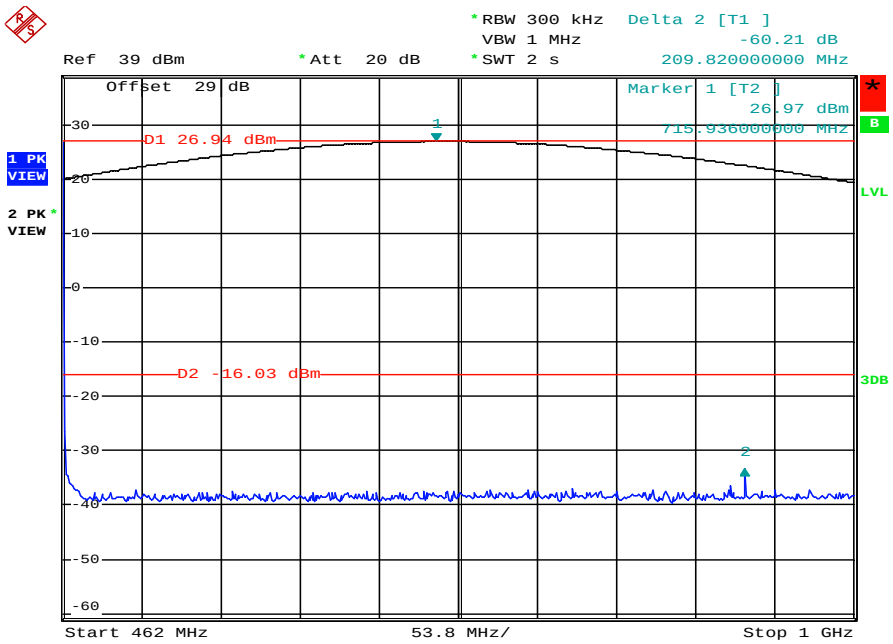


Date: 8.JUL.2016 10:44:39

Plot for Reference Only

Frequency Range (MHz):	1000-5000
Channel:	FRS Channel 1
Channel Frequency (MHz):	462.5625
Modulation:	CW
Emission (dBm):	None Detected

§95.635, RSS-210 A6.2.5 — Conducted Spurious Emissions

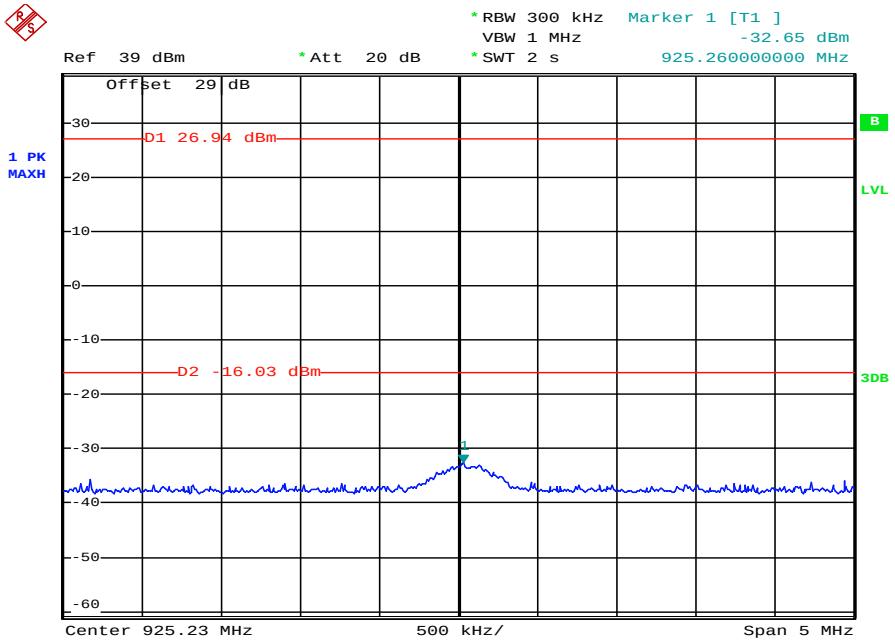


Date: 8.JUL.2016 10:22:25

Plot for Reference Only

Frequency Range (MHz):	462-1000
Channel:	GMRS Channel 2
Channel Frequency (MHz):	462.5625
Modulation:	CW
Emission (dBm):	-60.21dBc

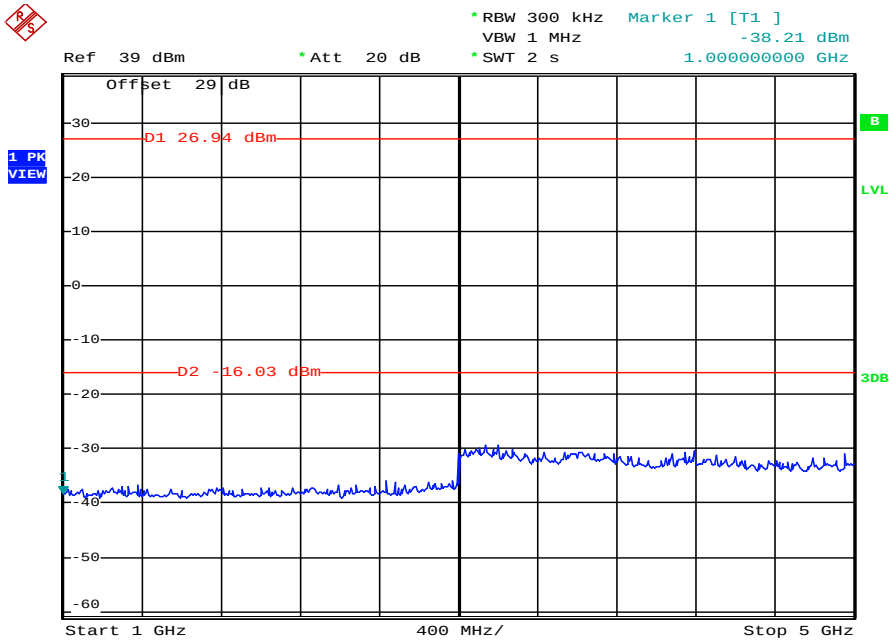
§95.635, RSS-210 A6.2.5	Conducted Spurious Emissions



Plot for Reference Only

Frequency Range (MHz):	922-927
Channel:	GMRS Channel 2
Channel Frequency (MHz):	462.5625
Modulation:	CW
Emission (dBm):	-32.65

§95.635, RSS-210 A6.1.5	Conducted Spurious Emissions



Date: 8.JUL.2016 10:28:47

Plot for Reference Only

Frequency Range (MHz):	1000-5000
Channel:	FRS Channel 1
Channel Frequency (MHz):	462.5625
Modulation:	CW
Emission (dBm):	None Detected

§27.53(c) Conducted Spurious Emissions						
Frequency (MHz)	DUT Modulation	Fundemental Power [P] (dBm)	Out of Band Emission [P_E] (dBm)	Attenuation [dB]	Limit (dB)	Margin (dB)
925.23	CW	26.9	-32.7	59.6	43.0	16.59
Attenuation = P - P_E						
Margin = Limit - Attenuation						
				Result:	**Complies**	

Notes:

All Spurious Emissions were evaluated to the 10th harmonic (5GHz). No other emissions were observed.
Data for fundamental presented using a peak detector compared to average limits
The device was tested using a new DC battery throughout all testing

APPENDIX F – RADIATED TX SPURIOUS EMISSIONS

Test Conditions	
Normative Reference	FCC 47 CFR §2.1051, §95.635, RSS-210 A6.1.5, A6.2.5
Procedure Reference	ANSI/TIA/EIA-603-D, ANSI C63.4

Limits	
With Filtering 47 CFR §95.635 RSS-210 A6.1.5, A6.2.5	(1) 25 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 50%, up to and including 100% of the authorized bandwidth (3) 35 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 100%, up to and including 250% of the authorized bandwidth (7) 43 dB + 10 log10(carrier power in watts) dB, measured with a bandwidth of at least 30 kHz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 250% of the authorized bandwidth
Without Filtering 47 CFR §95.635 RSS-210 A6.1.5, A6.2.5	(5)At least 83 log10 (fd/5) dB on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz), of more than 5 kHz up to and including 10 kHz (6) At least 116 log10 (fd/6.1) dB, or if less, 50 + 10 log10 (T) dB, on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz), of more than 10 kHz up to and including 250% of the authorized bandwidth (7) 43 dB + 10 log10(carrier power in watts) dB, measured with a bandwidth of at least 30 kHz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 250% of the authorized bandwidth

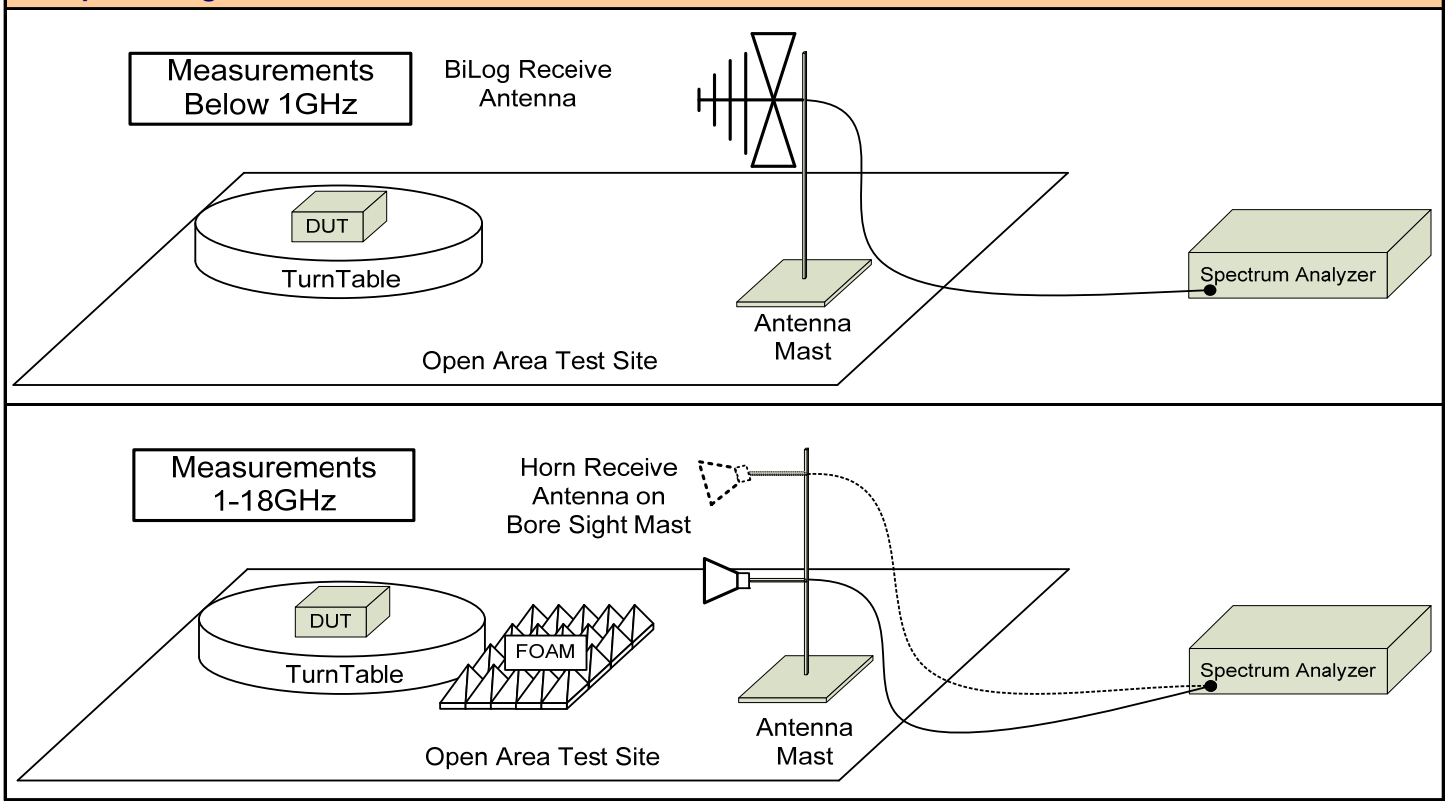
Environmental Conditions (Typical)	
Temperature	25°C
Humidity	<60%
Barometric Pressure	101 +/- 3kPa

Equipment List

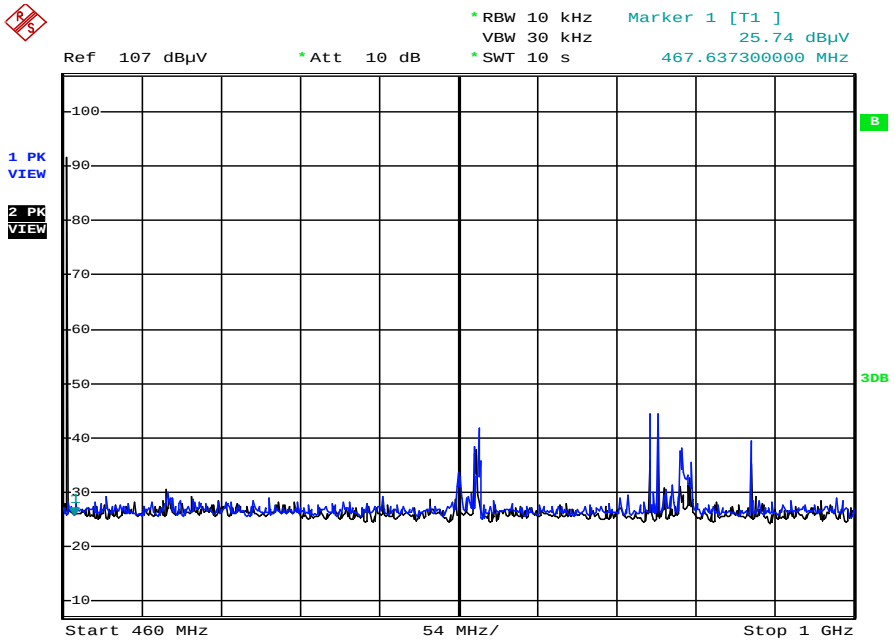
Asset Number	Manufacturer	Model Number	Description
00051	HP	8566B	Spectrum Analyzer
00049	HP	85650A	Quasi-peak Adapter
00047	HP	85685A	RF Preselector
00072	EMCO	2075	Mini-mast
00073	EMCO	2080	Turn Table
00071	EMCO	2090	Multi-Device Controller
00265	Miteq	JS32-00104000-58-5P	Microwave L/N Amplifier
00241	R&S	FSU40	Spectrum Analyzer
00050	Chase	CBL-6111A	Bilog Antenna
00275	Coaxis	LMR400	25m Cable
00276	Coaxis	LMR400	4m Cable
00278	TILE	34G3	TILE Test Software
00034	ETS	3115	Double Ridged Guide Horn

CNR: Calibration Not Required
COU: Calibrate On Use

Set-Up Drawing - DUT Measurement



§95.635, RSS-210 A6.2.5	Radiated Spurious Emissions



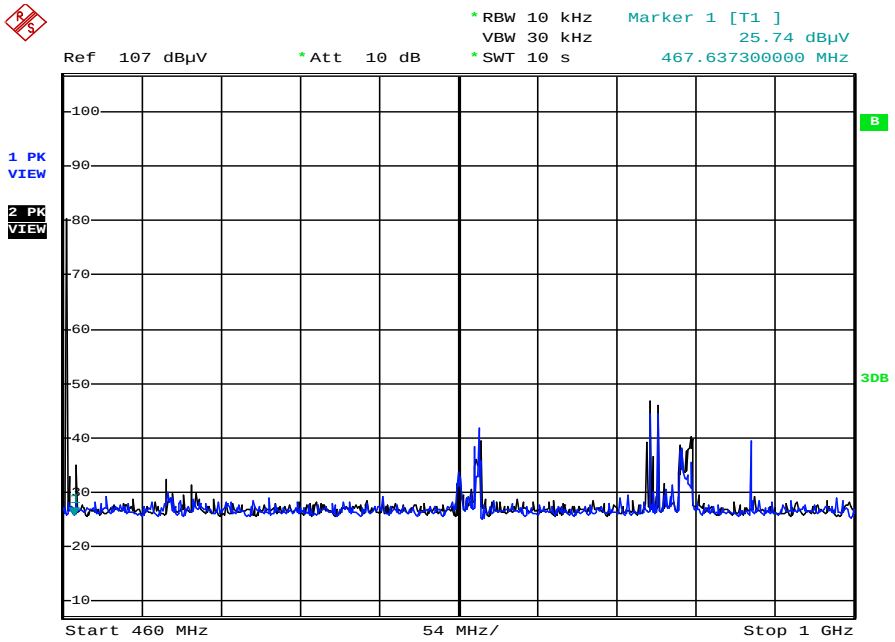
Date: 6.JUL.2016 15:07:40

Plot for Reference Only

Trace 1 (Blacl): EUT, Trace 2 (Blue): Ambient

Frequency Range (MHz):	460-1000
Channel:	GMRS Channel 2
Channel Frequency (MHz):	462.5625
Modulation:	CW
Receive Antenna Polarization:	Horizontal
Emission (dBm):	None Detected

§95.635, RSS-210 A6.1.5	Radiated Spurious Emissions



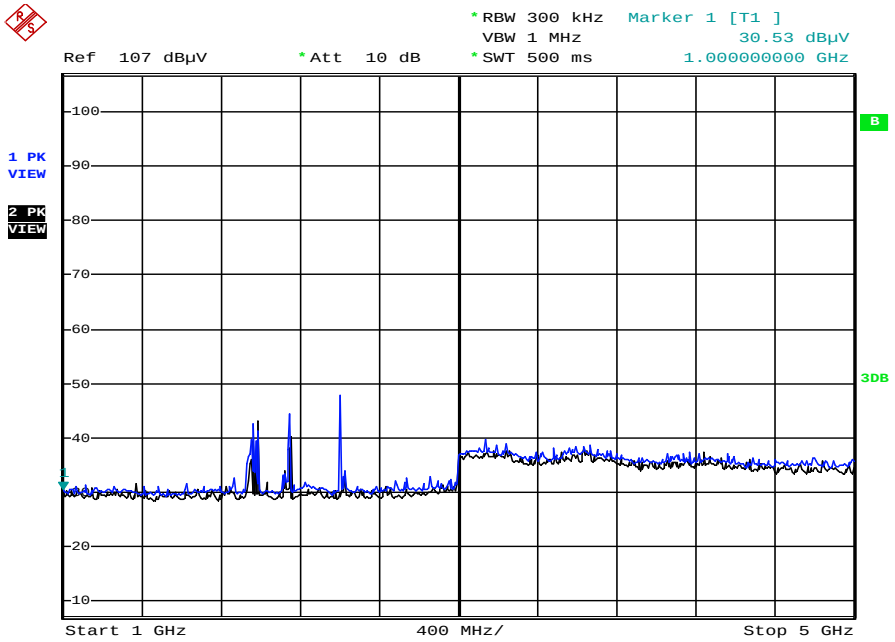
Date: 6.JUL.2016 15:06:12

Plot for Reference Only

Trace 1 (Blacl): EUT, Trace 2 (Blue): Ambient

Frequency Range (MHz):	460-1000
Channel:	GMRS Channel 2
Channel Frequency (MHz):	462.5625
Modulation:	CW
Receive Antenna Polarization:	Vertical
Emission (dBm):	None Detected

§95.635, RSS-210 A6.2.5	Radiated Spurious Emissions



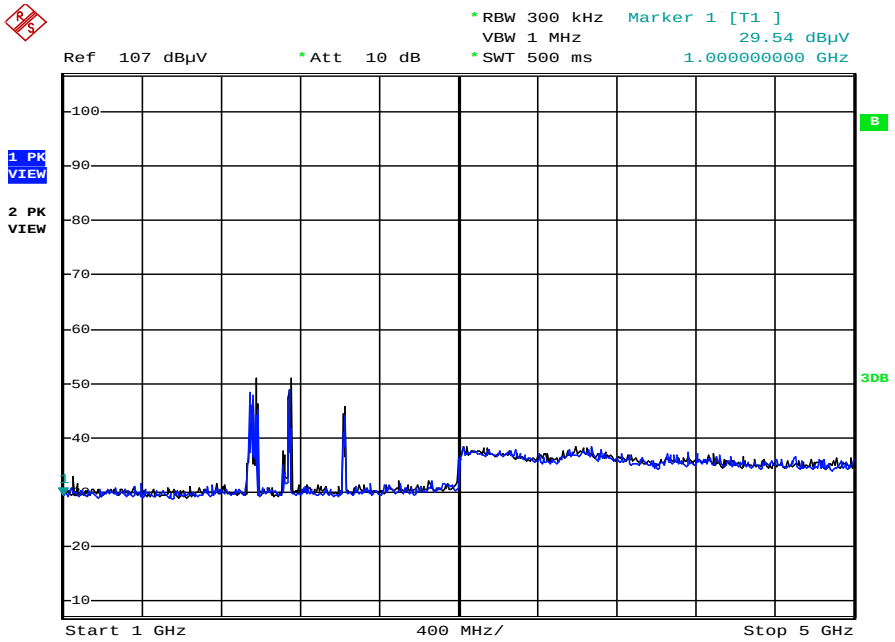
Date: 6.JUL.2016 15:51:34

Plot for Reference Only

Trace 1 (Blacl): EUT, Trace 2 (Blue): Ambient

Frequency Range (MHz):	1000 - 5000
Channel:	GMRS Channel 2
Channel Frequency (MHz):	462.5625
Modulation:	CW
Receive Antenna Polarization:	Horizontal
Emission (dBm):	None Detected

§95.635, RSS-210 A6.1.5	Radiated Spurious Emissions



Date: 6.JUL.2016 15:53:41

Plot for Reference Only

Trace 1 (Blacl): EUT, Trace 2 (Blue): Ambient

Frequency Range (MHz):	1000 - 5000
Channel:	GMRS Channel 2
Channel Frequency (MHz):	462.5625
Modulation:	CW
Receive Antenna Polarization:	Vertical
Emission (dBm):	None Detected

§95.635, RSS-210 A6.2.5						Radiated Spurious Emissions						
Freq (MHz)	DUT Freq (MHz)	DUT Modulation	Receive Antenna Polarization	Measured Emission* [E_{Meas}] (dBuV)	Measured Distance [D] (m)	Receive** Antenna Factor [AF] (dB)	Cable Loss [L_C] (dB)	Emission @ 3m [E_{3m}] (dBuV/m)	Correction Factor [CF]	Corrected Emission [E_{Corr}] (dBm)	Limit (dBm)	Margin (dB)
460 - 1000	462.5625	CW	Vertical	25.7	3.0	24.5	3.1	53.4	-97.40	-44.02	-13.00	31.02
		CW	Horizontal	25.7	3.0	24.7	3.1	53.5	-97.40	-43.90	-13.00	30.90
1000 - 5000	462.5625	CW	Vertical	29.5	3.0	32.5	7.0	69.0	-95.30	-26.30	-13.00	13.30
		CW	Horizontal	30.5	3.0	32.5	7.0	70.0	-95.30	-25.30	-13.00	12.30

* No Emissions Detected, Noise Floor Measured

$E_{3m} = E_{Meas} + L_C + AF$

CF = E(dBuV/m) +20Log(D) -104.8 - 2.15 for F < 1GHz ERP

CF = E(dBuV/m) +20Log(D) -104.8 for F > 1GHz EIRP

$E_{Corr} = E_{3m} + CF$

Result: Complies

APPENDIX G – RADIATED RX SPURIOUS EMISSIONS

Test Conditions	
Normative Reference	FCC 47 CFR §15.109
Procedure Reference	ANSI/TIA/EIA-603-D, ANSI C63.4

Limits	
FCC §15.109	30-88MHz: 40dBuV/m 88-216MHz: 43.5dBuV/m 216-960MHz: 46dBuV/m > 960MHz: 54dBuV/m

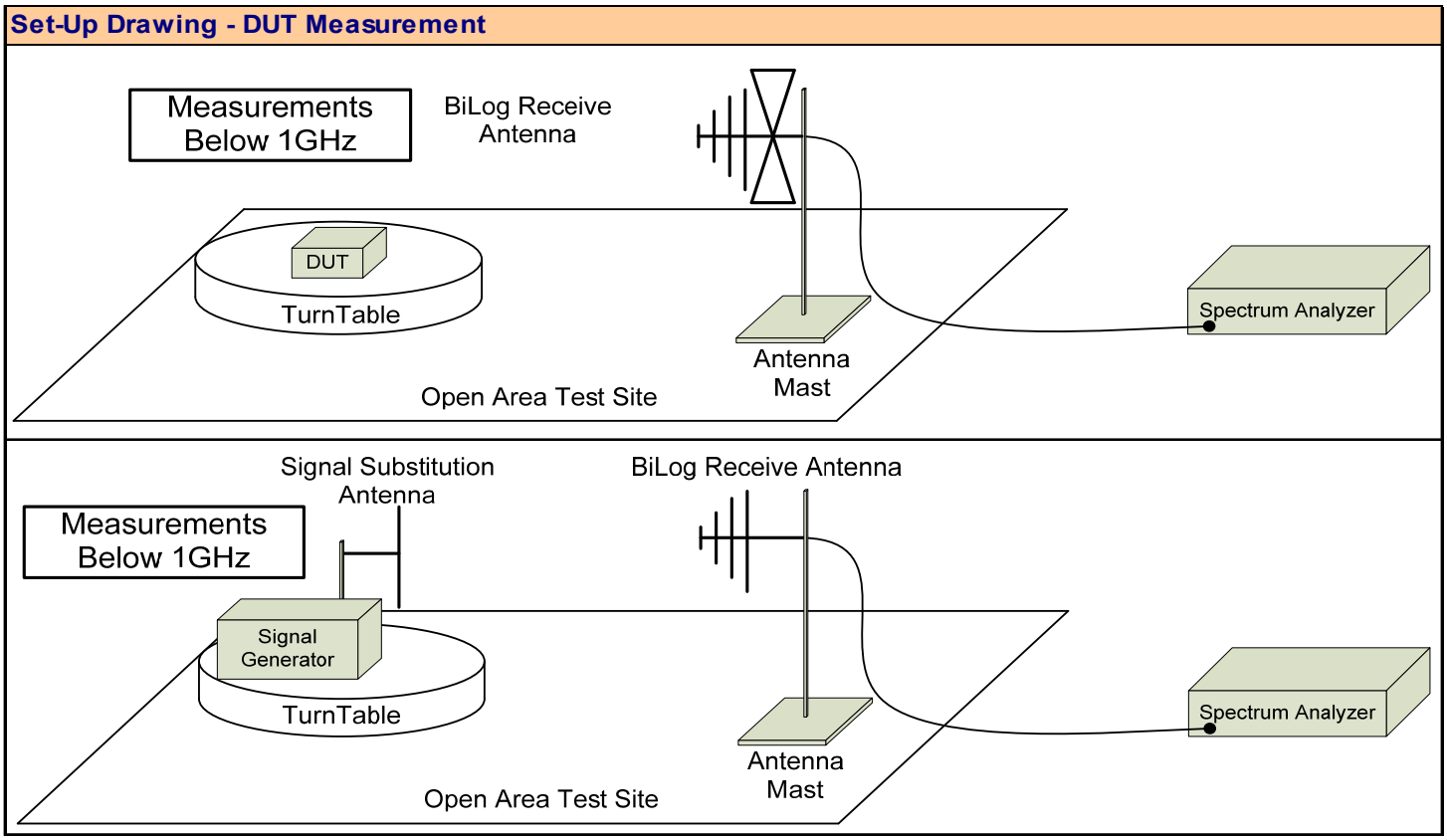
Environmental Conditions (Typical)	
Temperature	25°C
Humidity	<60%
Barometric Pressure	101 +/- 3kPa

Equipment List

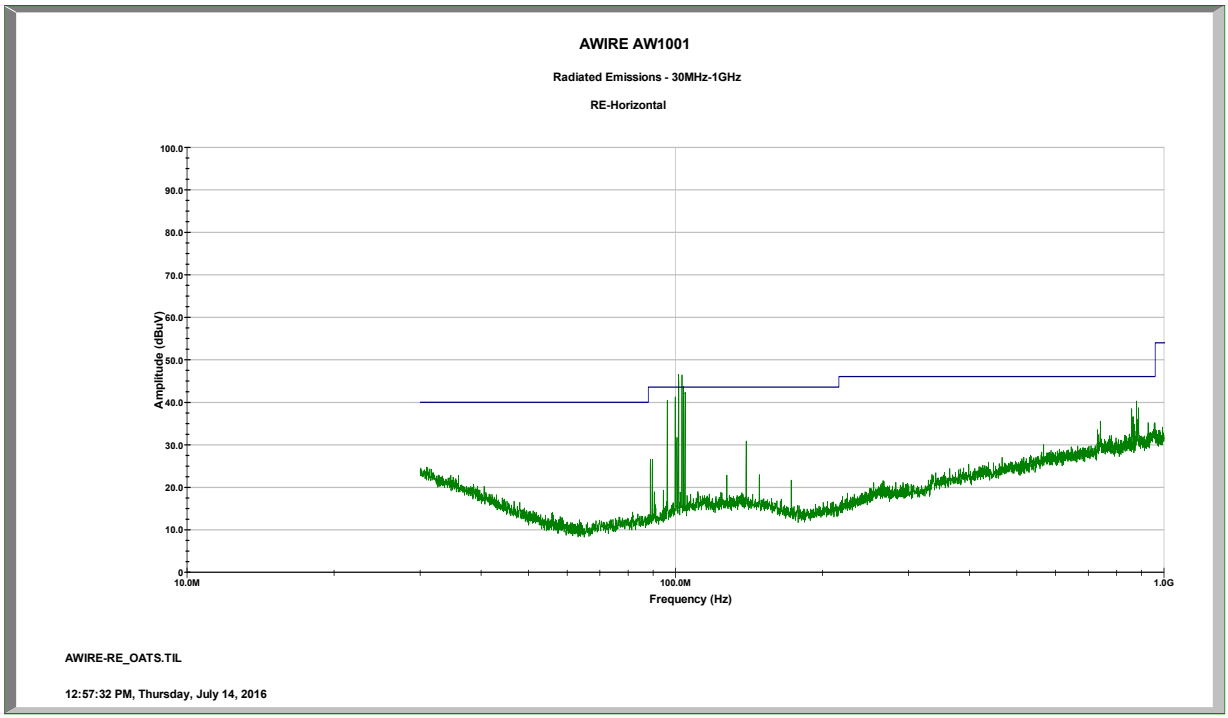
Asset Number	Manufacturer	Model Number	Description
00051	HP	8566B	Spectrum Analyzer
00049	HP	85650A	Quasi-peak Adapter
00047	HP	85685A	RF Preselector
00072	EMCO	2075	Mini-mast
00073	EMCO	2080	Turn Table
00071	EMCO	2090	Multi-Device Controller
00265	Miteq	JS32-00104000-58-5P	Microwave L/N Amplifier
00241	R&S	FSU40	Spectrum Analyzer
00050	Chase	CBL-6111A	Bilog Antenna
00275	Coaxis	LMR400	25m Cable
00276	Coaxis	LMR400	4m Cable
00278	TILE	34G3	TILE Test Software
00034	ETS	3115	Double Ridged Guide Horn

CNR: Calibration Not Required
COU: Calibrate On Use

Set-Up Drawing - DUT Measurement



§15B Radiated Rx Spurious Emissions

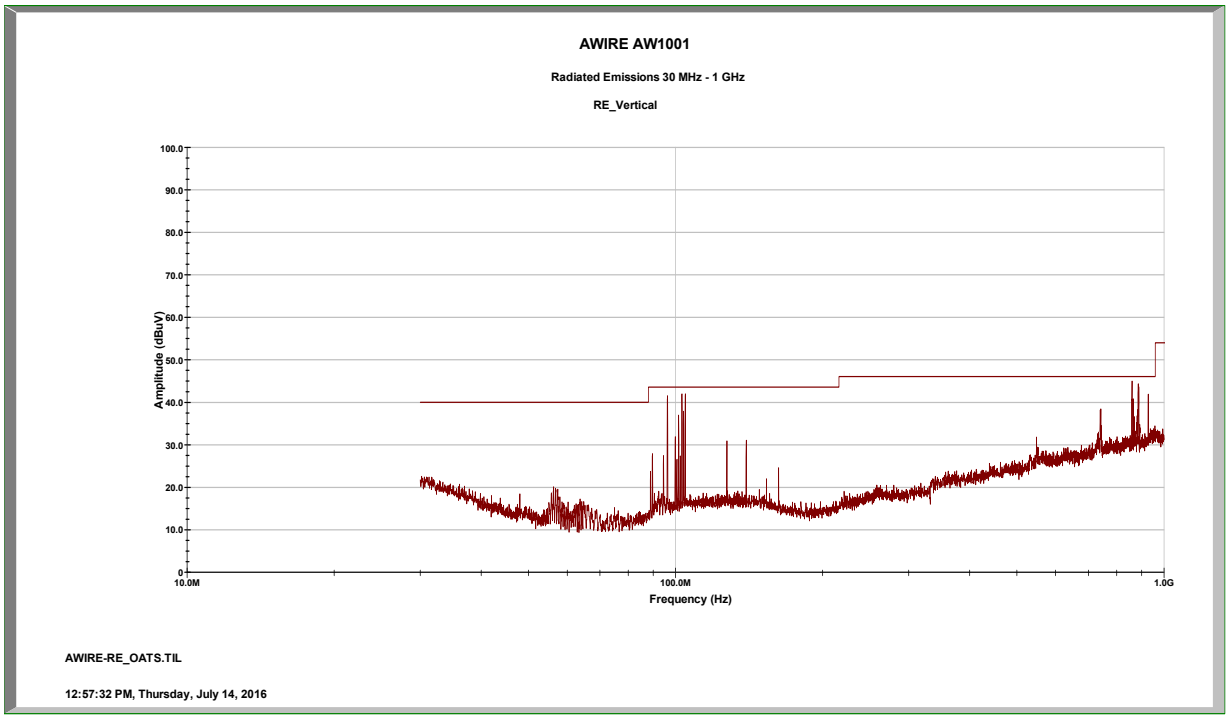


Plot for Reference Only

Emissions shown are ambient.

Frequency Range (MHz):	30 - 1000
Receive Antenna Polarization:	Horizontal
Emission (dBm):	None Detected

§15B Radiated Rx Spurious Emissions



Plot for Reference Only

Emissions shown are ambient.

Frequency Range (MHz):	30 - 1000
Receive Antenna Polarization:	Vertical
Emission (dBm):	None Detected

APPENDIX H – FREQUENCY STABILITY

Test Conditions	
Normative Reference	FCC 47 CFR §2.1055, §95.621, §95.627, RSS-210 A6.1.6, A6.2.6

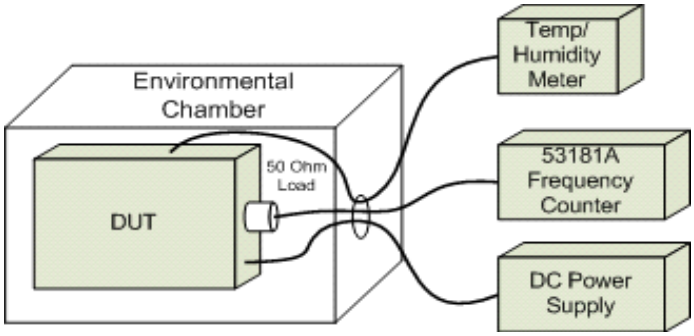
Limits	
FCC §95.627	FRS - Frequency Tolerance better than 0.00025%
FCC §95.621	GMRS - Frequency Tolerance better than 0.0005%
RSS-210 A6.1.6, A6.2.6	GMRS/FRS - Frequency Tolerance better than ± 5PPM

Test Conditions	
Temperature	-30°C to +50°C at 10°C Increments
Humidity	<100% Non Condensating
Voltage (VDC)	9.8VDC(*) - 20VDC - 34.5VDC(115%)

Equipment List

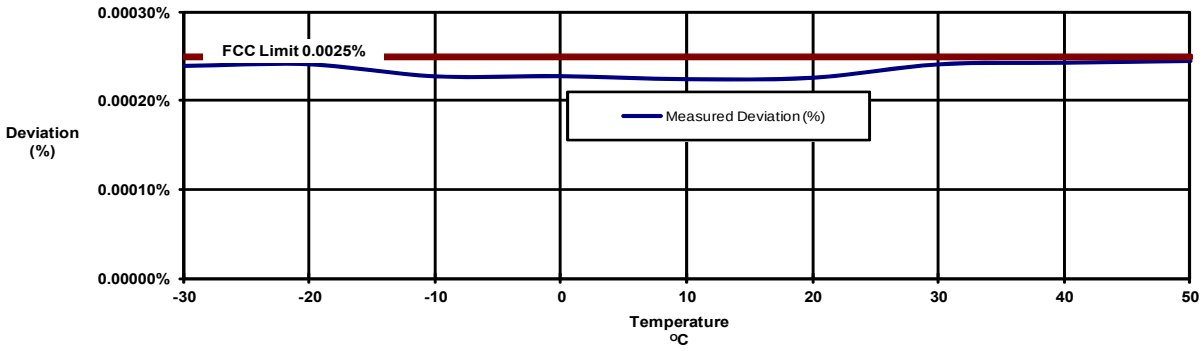
Asset Number	Manufacturer	Model Number	Description
n/a	ESPEC	ECT-2	Environmental Chamber
00003	HP	53181A	Frequency Counter
n/a	HP	E3611A	Power Supply
00234	VWR	61161-378	Temp/Humidity Meter

Set-Up Drawing



Frequency Stability

Channel:	FRS Ch 7
Nomimal Frequency (MHz):	462.7125



Frequency Stability Measurements (Temperature)

Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation (%)	Deviation (PPM)
-30	462.712500	462.711390	1110	0.000240%	-2.40
-20	462.712500	462.711381	1119	0.000242%	-2.42
-10	462.712500	462.711447	1053	0.000228%	-2.28
0	462.712500	462.711446	1054	0.000228%	-2.28
10	462.712500	462.711463	1037	0.000224%	-2.24
20	462.712500	462.711455	1045	0.000226%	-2.26
30	462.712500	462.711381	1119	0.000242%	-2.42
40	462.712500	462.711373	1127	0.000244%	-2.44
50	462.712500	462.711363	1137	0.000246%	-2.46
			Maximum Deviation:	0.000246%	-2.46
			Maximum Limit:	0.005000%	±5.0 PPM*
			Result:	Complies	

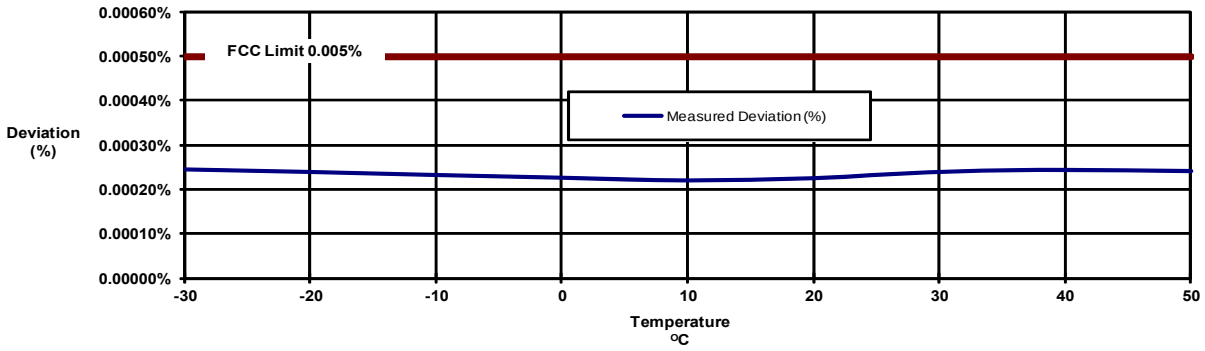
Frequency Stability Measurements (Voltage)

Voltage (VDC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation (%)	Deviation (PPM)
Full Charge	462.712500	462.711455	1045	0.000226%	-2.26
Depleted	462.712500	462.711389	1111	0.000240%	-2.40
			Maximum Deviation:	0.000240%	-2.40
			Maximum Limit:	0.00250%	±5.0 PPM*
			Result:	Complies	

*Per RSS-210 A6.1.6

Frequency Stability

Channel:	GMRS Ch 14
Nomimal Frequency (MHz):	462.7125



Frequency Stability Measurements (Temperature)

Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation (%)	Deviation (PPM)
-30	462.712500	462.711367	1133	0.000245%	-2.45
-20	462.712500	462.711391	1109	0.000240%	-2.40
-10	462.712500	462.711421	1079	0.000233%	-2.33
0	462.712500	462.711448	1052	0.000227%	-2.27
10	462.712500	462.711474	1026	0.000222%	-2.22
20	462.712500	462.711452	1048	0.000227%	-2.27
30	462.712500	462.711390	1110	0.000240%	-2.40
40	462.712500	462.711372	1128	0.000244%	-2.44
50	462.712500	462.711382	1118	0.000242%	-2.42
			Maximum Deviation:	0.000245%	-2.45
			Maximum Limit:	0.005000%	±5.0 PPM
			Result:	Complies	

Frequency Stability Measurements (Voltage)

Voltage (VDC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation (%)	Deviation (PPM)
Full Charge	462.712500	462.711452	1048	0.000227%	-2.27
Depleted	462.712500	462.711368	1132	0.000245%	-2.45
			Maximum Deviation:	0.000245%	-2.45
			Maximum Limit:	0.00500%	±5.0 PPM
			Result:	Complies	

APPENDIX I – EQUIPMENT LIST AND CALIBRATION

Equipment List

Asset Number	Manufacturer	Model Number	Serial Number	Description	Last Calibrated	Calibration Interval
00003	HP	53181A	3736A05175	Frequency Counter	28 Apr 2014	Triennial
00034	ETS	3115	6267	Double Ridged Guide Horn	02 Dec 2015	Triennial
00047	HP	85685A	2837A00826	RF Preselector	30 Apr 2014	Triennial
00049	HP	85650A	2043A00162	Quasi-peak Adapter	30 Apr 2014	Triennial
00050	Chase	CBL-6111A	1607	Bilog Antenna	25 Apr 2014	Triennial
00051	HP	8566B	2747A05510	Spectrum Analyzer	30 Apr 2014	Triennial
00071	EMCO	2090	9912-1484	Multi-Device Controller	n/a	n/a
00072	EMCO	2075	0001-2277	Mini-mast	n/a	n/a
00073	EMCO	2080	0002-1002	Turn Table	n/a	n/a
00121	HP	E3611A	KR83015294	Power Supply	COU	n/a
00129	ESPEC	ECT-2	0510154-B	Environmental Chamber	CNR	n/a
00234	VWR	61161-378	140320430	Temp/Humidity Meter	New	Triennial
00241	R&S	FSU40	100500	Spectrum Analyzer	23 Apr 2015	Triennial
00265	Miteq	JS32-00104000-58-5P	1939850	Microwave L/N Amplifier	COU	n/a
00275	Coaxis	LMR400	n/a	25m Cable	COU	n/a
00276	Coaxis	LMR400	n/a	4m Cable	COU	n/a
00278	TILE	34G3	n/a	TILE Test Software	NCR	n/a

CNR: Calibration Not Required
COU: Calibrate On Use

APPENDIX J – MEASUREMENT INSTRUMENT UNCERTAINTY

CISPR 16-4 Measurement Uncertainty (U_{LAB})	
This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence interval using a coverage factor of k=2	
30MHz - 200MHz	
U_{LAB} = 5.14dB U_{CISPR} = 6.3dB	
200MHz - 1000MHz	
U_{LAB} = 5.90dB U_{CISPR} = 6.3dB	
1GHz - 6GHz	
U_{LAB} = 4.80dB U_{CISPR} = 5.2dB	
6GHz - 18GHz	
U_{LAB} = 5.1dB U_{CISPR} = 5.5dB	
If the calculated uncertainty **U_{lab}** is **less** than **U_{CISPR}** then:	
1	Compliance is deemed to occur if **NO** measured disturbance exceeds the disturbance limit
2	Non-Compliance is deemed to occur if **ANY** measured disturbance **EXCEEDS** the disturbance limit
If the calculated uncertainty **U_{lab}** is **greater** than **U_{CISPR}** then:	
3	Compliance is deemed to occur if **NO** measured disturbance, increased by (**U_{lab} - U_{CISPR}**), exceeds the disturbance limit
4	Non-Compliance is deemed to occur if **ANY** measured disturbance, increased by (**U_{lab} - U_{CISPR}**), **EXCEEDS** the disturbance limit

