Nemko Test Report:	142181-1TRFWL
Applicant:	Barrett Communications Pty 10 Port Kembla Drive, Bibra Lake, Perth, Western Australia, 6163
Apparatus:	2090 Transceiver
FCC ID:	OW4-PRC2090HF
In Accordance With:	FCC Part 90 Private Land Mobile Radio Services
Authorized By:	Andrey Adelberg, Senior Wireless/EMC Specialist
Date:	July 15, 2010
Total Number of Pages:	37

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Section 1 : Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90. Conducted measurements were performed in accordance with ANSI TIA-603-B-2002. Radiated tests were conducted is accordance with ANSI C63.4-2003.

The assessment summary is as follows:

Apparatus Assessed:	2090 Transceiver
Specification:	FCC Part 90
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release
Test Location:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Registration Number:	176392 (3 m Semi-Anechoic Chamber)
Tests Performed By:	Kevin Ma
Test Dates:	May 2010

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Section 2 : Equipment Under Test

2.1 Identification of Equipment Under Test (EUT)

The following information identifies the EUT under test:

Type of Equipment:	HF Transceiver
Brand Name:	Barrett Communications
Model Name or Number:	PRC-2090 HF
Serial Number:	N/A
Nemko Sample Number:	1
FCC ID:	OW4-PRC2090HF
Date of Receipt:	May 21, 2010

2.2 Accessories

The following information identifies accessories used to exercise the EUT during testing:

Description:	Power Supply
Brand Name:	Barrett Communications
Model Name or Number:	PRC-2090
Serial Number:	209701004
Nemko Sample Number:	2
Connection Port:	7Pin Female DSub connector/2Pin Female Mil Spec Connector
Cable Length and Type:	1 m

Description:	Vehicle Docking Station
Brand Name:	Barrett Communications
Model Name or Number:	PRC-2090
Serial Number:	N/A
Nemko Sample Number:	3
Connection Port:	Docking Station connector
Cable Length and Type:	N/A

2.3 EUT Description

The EUT is a HF transceiver that designed to provide communications on the HF band using a single sideband transmission mode with two configurations, 30 Watt Manpack and 100 Watt Vehicle Docking Station.

2.4 Technical Specifications of the EUT

Operating Band: Below 25 MHz and 25–50 MHz

Operating Frequency: 2–29.9 MHz

Modulation: SSB

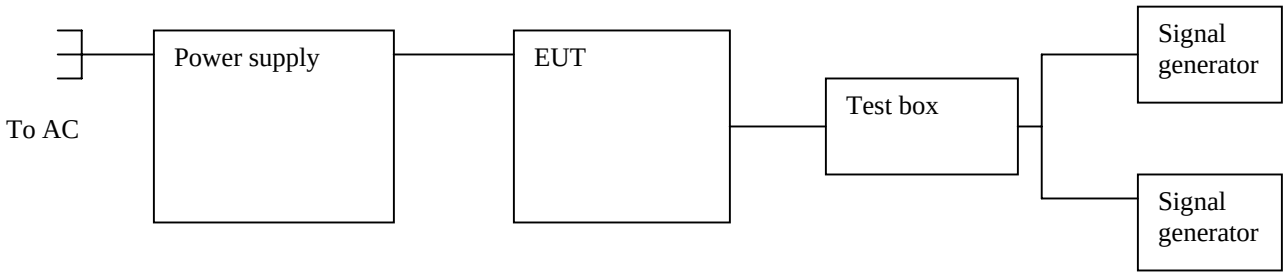
Occupied Bandwidth: 2.05 kHz

Emission Designator: J3E

Antenna Data: Detached antenna

Power Supply Requirements: 110 VAC/ 60 Hz via PRC-2090 power supply

2.5 EUT Setup diagram



2.6 Operation of the EUT during testing

The EUT was controlled to transmit constantly at desired frequency.

2.7 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

Section 3 : Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 2 Subpart J, Equipment Authorization Procedures
FCC Part 90 Private Land Mobile Radio Services

3.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15–30 °C
Humidity range	:	20–75 %
Pressure range	:	86–106 kPa
Power supply range	:	±5 % of rated voltages

3.4 Measurement Uncertainty

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95 % and can be found in Nemko Canada document MU-003.

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Cal. Date	Next Cal.
3 m EMI Test Chamber	TDK	SAC-3	FA002047	Mar. 09/10	Mar. 09/11
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR	NCR
Controller	Sunol	SC104V	FA002060	NCR	NCR
Mast	Sunol	TLT2	FA002061	NCR	NCR
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Jan. 14/10	Jan. 14/11
Bilog	Sunol	JB3	FA002108	Jan. 18/10	Jan. 18/11
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	Sept. 29/09	Sept. 29/10
Active Loop Antenna	EMCO	6502	FA001686	July 22/09	July 22/10
Signal Generator	HP	33120A	FA001082	Aug 14/09	Aug 14/10
Vector Signal Analyzer	HP	80410A	FA001571	Mar. 14/10	Mar. 14/11
Frequency Counter	HP	5352B	FA001915	Jan 08/10	Jan 08/11
Temperature Chamber	Thermotron	SM-16C	FA001030	NCR	NCR

COU – Calibrate on Use
NCR – No Calibration Required

Section 4 : Results Summary

This section contains the following:

FCC Part 90: Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No : not applicable / not relevant.

Y Yes : Mandatory i.e. the apparatus shall conform to these tests.

N/T Not Tested, mandatory but not assessed. (See Report Summary)

4.1 FCC Part 90: Test Results

Clause	Test Method	Test Description	Required	Result
90.205	2.1046	Output power	Y	PASS
90.207	—	Type of emissions	Y	PASS
90.209	2.1049	Occupied bandwidth	Y	PASS
90.210	2.1051	Spurious Emissions at the antenna terminal	Y	PASS
90.210	2.1053	Field strength of spurious radiation	Y	PASS
90.213	2.1055	Frequency stability	Y	PASS
90.214	—	Transient Behavior	N	
90.219	—	Use of signal boosters	N	
2.1047	2.1047	Modulation Characteristics	Y	PASS

Notes: None

Appendix A : Test Results

Clause 90.205 Output Power

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation. Except where otherwise specifically provided for, the maximum power that will be authorized to applicants whose license applications for new stations are filed after August 18, 1995 is as follows:
(a) Below 25 MHz. For single sideband operations (J3E emission), the maximum transmitter peak envelope power is 1000 watts (60 dBm).
(b) 25–50 MHz. The maximum transmitter output power is 300 watts (54.77 dBm).

Test Results: Pass

Additional Observations:

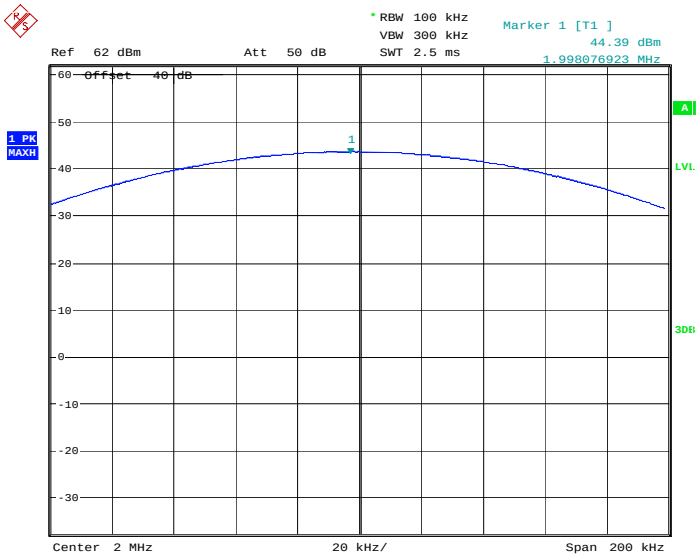
Two audio signals, 400 Hz and 1.8 kHz, have been added to the audio input of the EUT to achieve Peak Envelope Power.

All measurements were performed using a Peak Detector with 100 kHz/300 kHz RBW/VBW.

30 Watt Manpack:

Frequency (MHz)	Maximum PEP (dBm)	PEP Limits (dBm)	Margin (dB)
2.0	44.39	60.00	15.61
14.0	44.14	60.00	15.86
29.9	44.30	54.77	10.47

2 MHz Channel:



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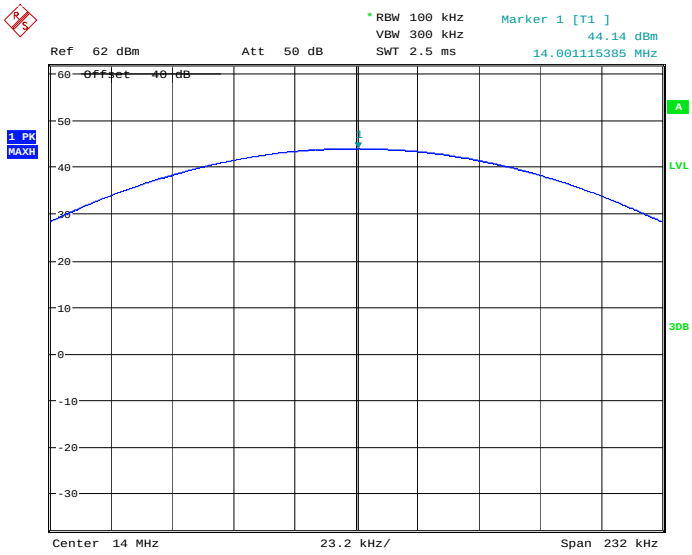
14 MHz Channel:



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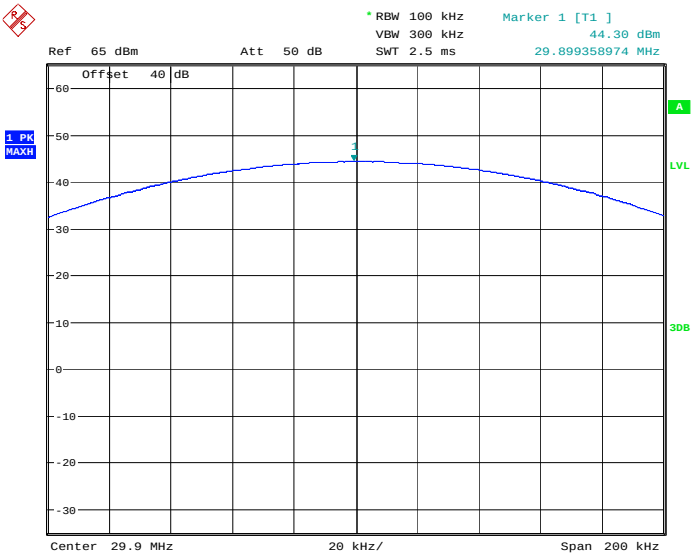
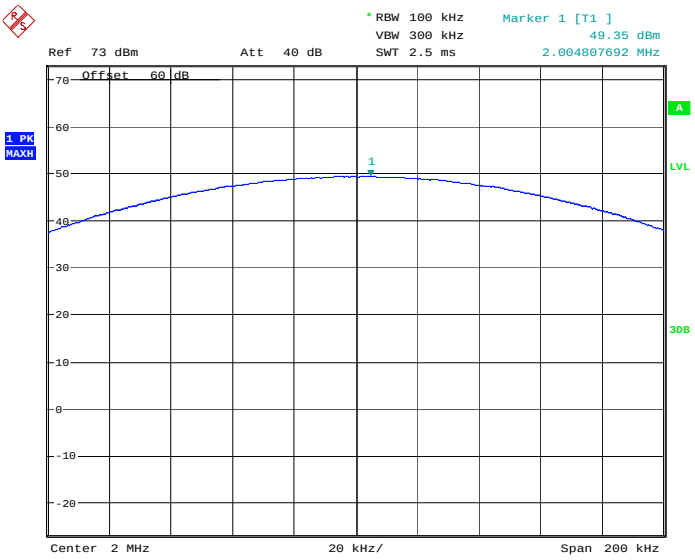
29.9 MHz Channel:



100 Watt Vehicle Docking Station

Frequency (MHz)	Maximum PEP (dBm)	PEP Limits (dBm)	Margin (dB)
2.0	49.35	60.00	10.65
14.0	49.92	60.00	10.08
29.9	49.86	54.77	4.91

2 MHz Channel:



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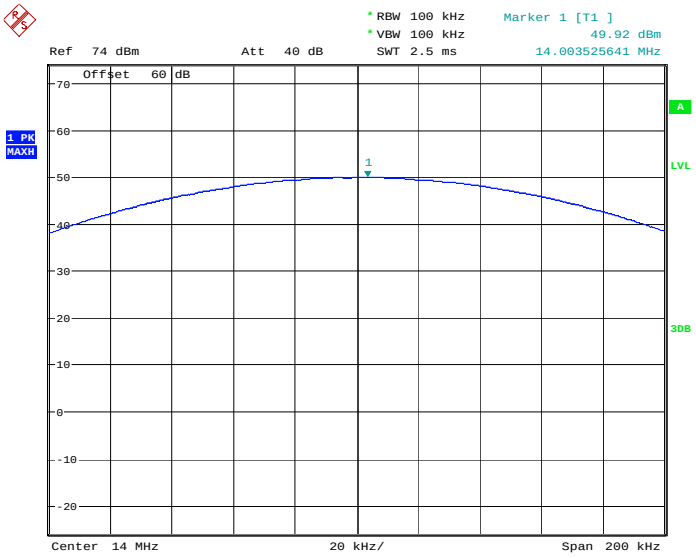

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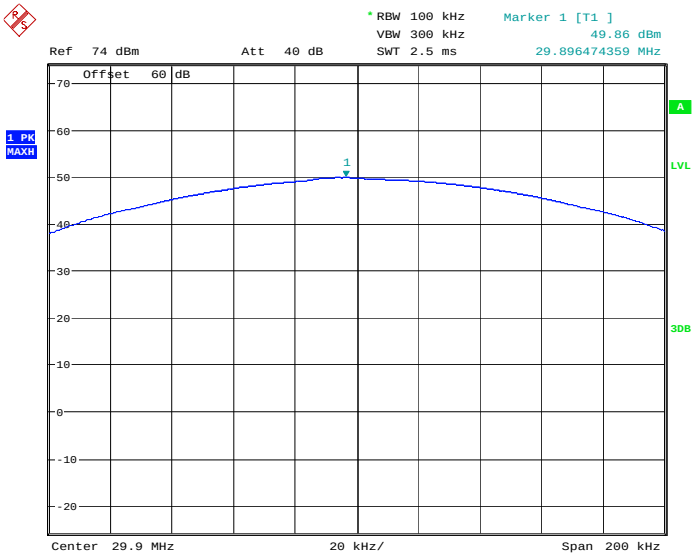
29.9 MHz Channel:



Date: 26.MAY.2010 15:40:19

Clause 90.207 Types of emissions

d) Except for Traveler's Information stations in the Public Safety Pool authorized in accordance with §90.242, only J3E emission will be authorized for telephony systems on frequencies below 25 MHz.

Test Results: Pass

Additional Observations:

The EUT is using J3E modulation.

Clause 90.209 Occupied Bandwidth

(2) For operations below 25 MHz utilizing J3E emission, the bandwidth occupied by the emission shall not exceed 3000 Hz. The assigned frequency will be specified in the authorization. The authorized carrier frequency will be 1400 Hz lower in frequency than the assigned frequency. Only upper sideband emission may be used. In the case of regularly available double sideband radiotelephone channels, an assigned frequency for J3E emissions is available either 1600 Hz below or 1400 Hz above the double sideband radiotelephone assigned frequency.

(5) Unless specified elsewhere, channel spacings and bandwidths that will be authorized in the following frequency bands are given in the following Table.

Standard Channel Spacing/Bandwidth

Frequency Band (MHz)	Channel Spacing (kHz)	Authorized Bandwidth (kHz)
Below 25	--	--
25-50	20	20
72-76	20	20
150-174	7.5	20/11.25/6
216-220	6.25	20/11.25/6
220-222	5	4
406-512	6.25	20/11.25/6
806-809/851-854	12.5	20
809-824/854-869	25	20
896-901/935-940	12.5	13.6
902-928	--	--
929-930	25	20
1427-1432	12.5	12.5
2450-2483.5	--	--
Above 2500	--	--

Test Results: Pass

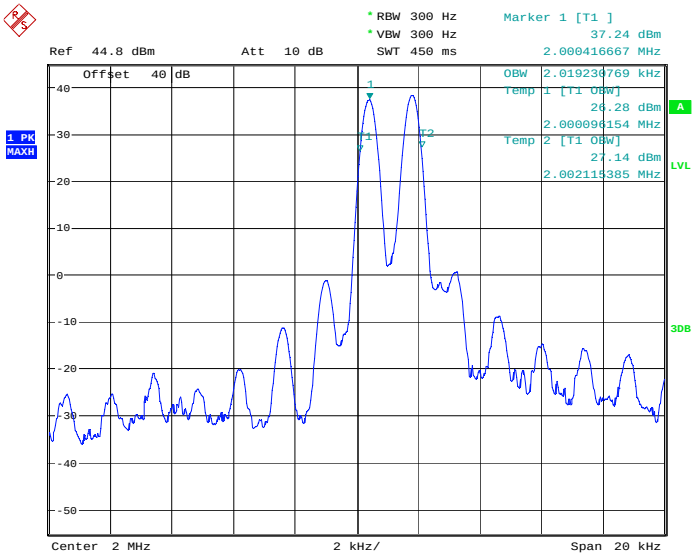
Additional Observations:

Two audio signals, 400 Hz and 1.8 kHz, have been added to the audio input of the EUT to achieve Peak Envelope Power.

30 Watt Manpack:

Operation Frequency (MHz)	Occupied Bandwidth (kHz)	Limits (kHz)	Margin (kHz)
2.0	2.019	3.0	0.981
14.0	2.019	3.0	0.981
29.9	2.019	20.0	17.981

2.0 MHz Channel:



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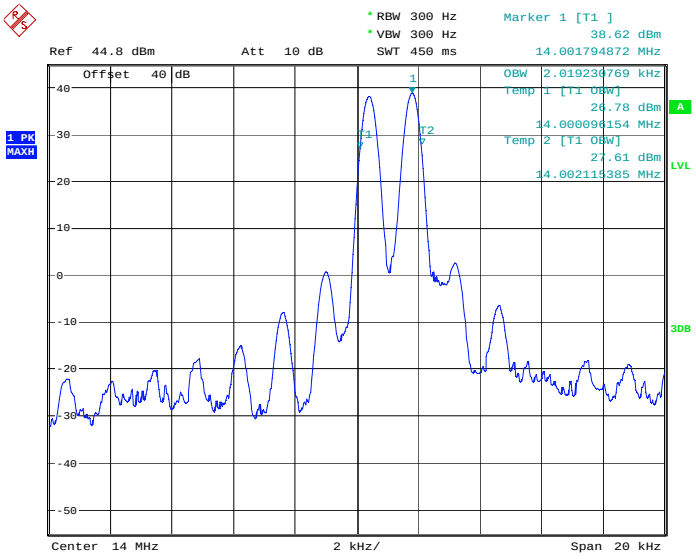
14.0 MHz Channel:



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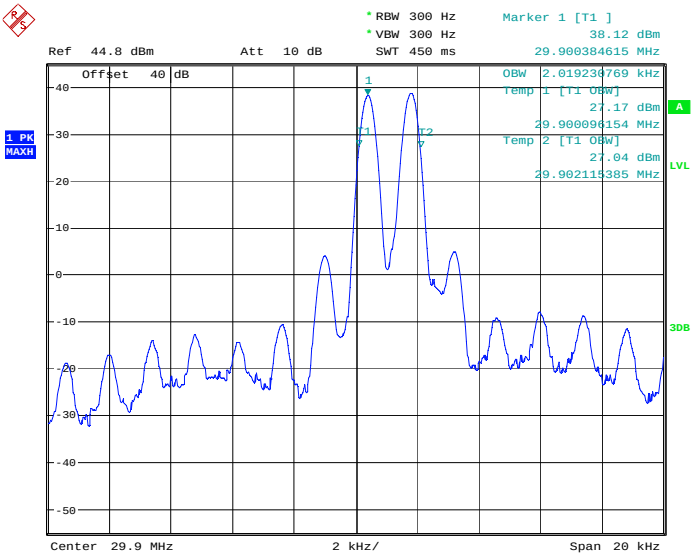
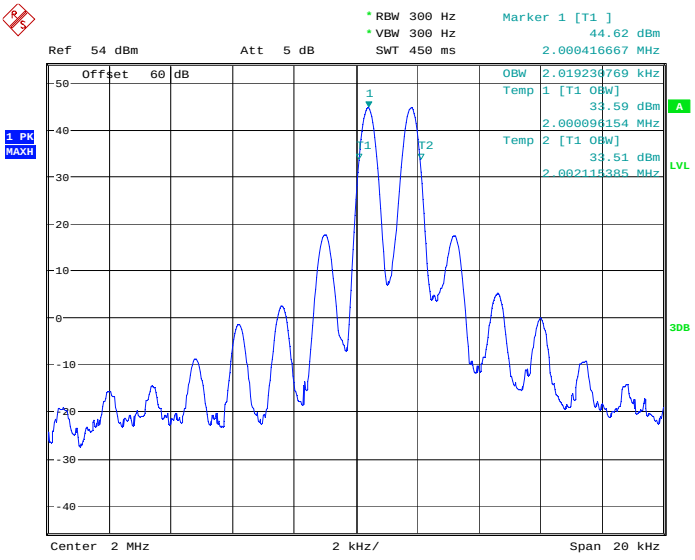
29.9 MHz Channel:



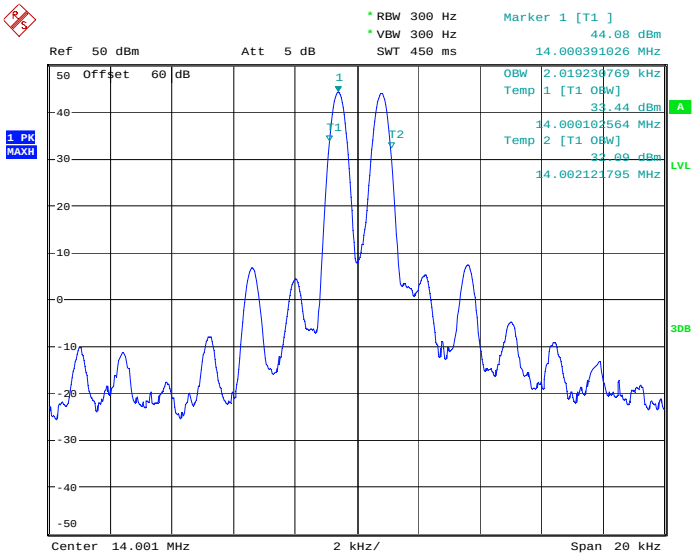
100 Watt Vehicle Docking Station:

Operation Frequency (MHz)	Occupied Bandwidth (kHz)	Limits (kHz)	Margin (kHz)
2.0	2.019	3.0	0.981
14.0	2.019	3.0	0.981
29.9	2.051	20.0	17.949

2.0 MHz Channel:



14.0 MHz Channel:



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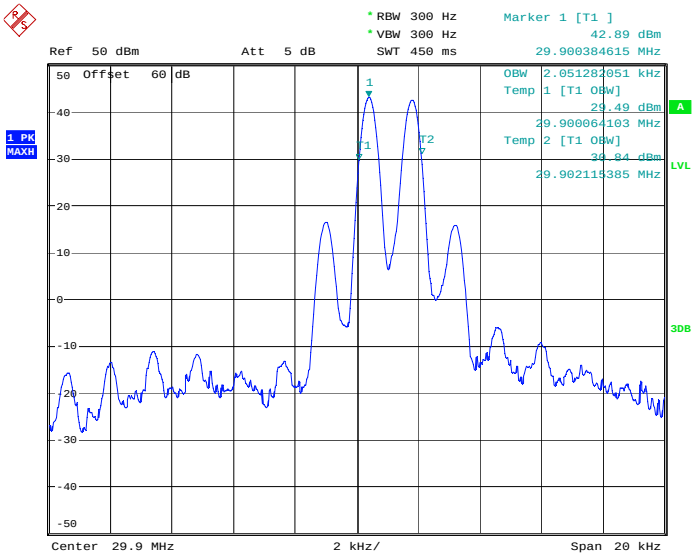
29.9 MHz Channel:



Date: 27.MAY.2010 14:45:35

Clause 90.210 Emission masks

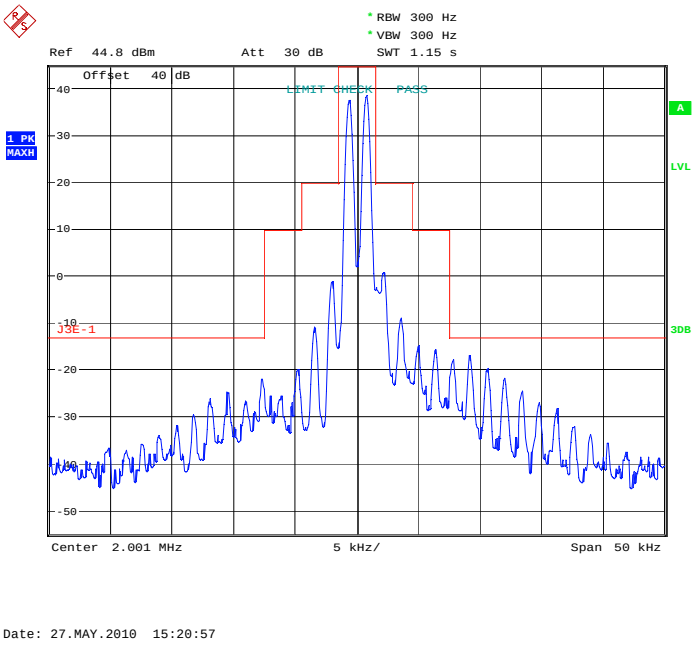
Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere, the Table below specifies the emission masks for equipment operating in the frequency bands governed under this part.

Test Results: Pass

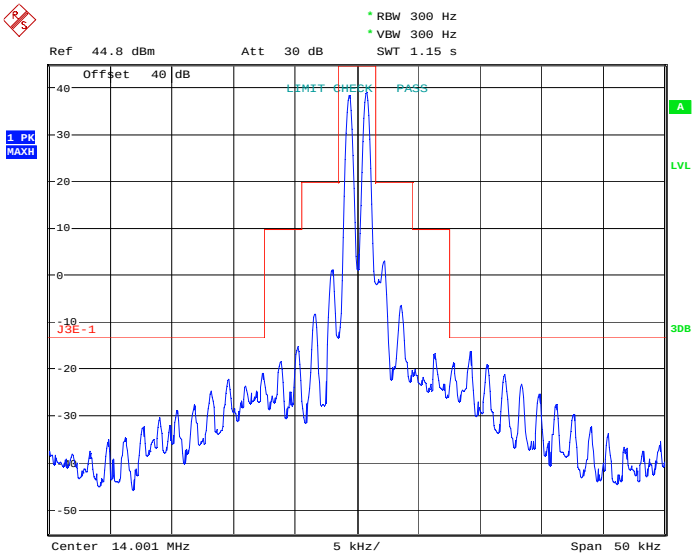
Additional Observations:

Refer to below plots.

30 Watt Manpack: Emission mask on 2.0 MHz Channel:

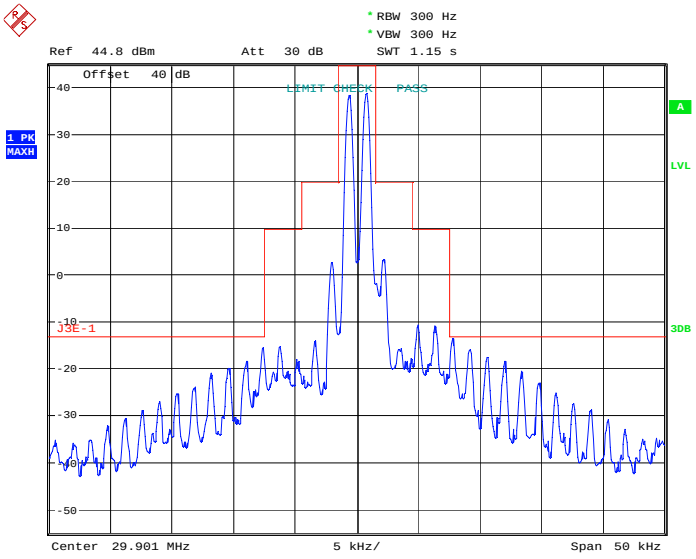


30 Watt Manpack: Emission mask on 14.0 MHz Channel:



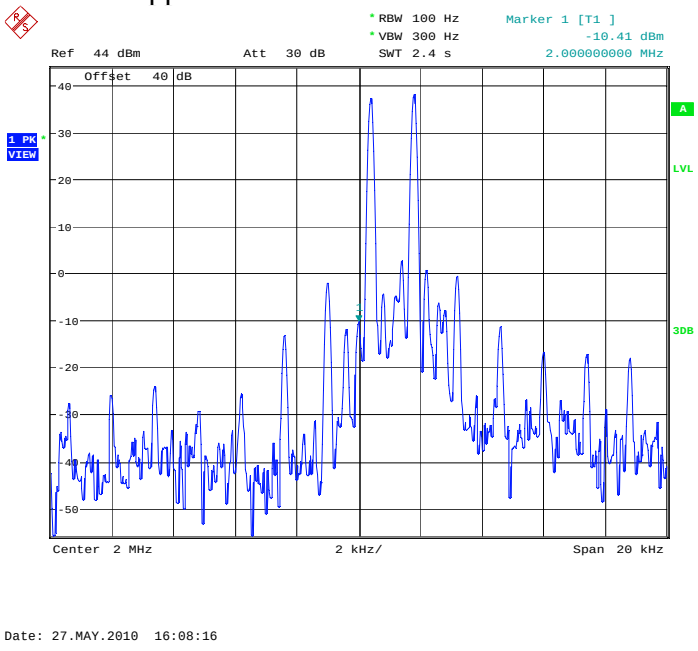
Date: 27.MAY.2010 15:19:59

30 Watt Manpack: Emission mask on 29.9 MHz Channel:



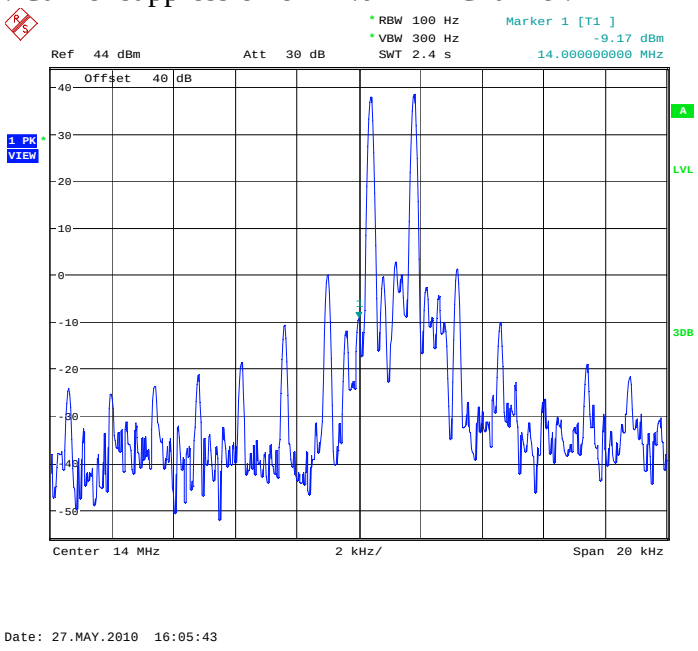
Date: 27.MAY.2010 15:14:43

30 Watt Manpack: Carrier suppression on 2.0 MHz Channel:



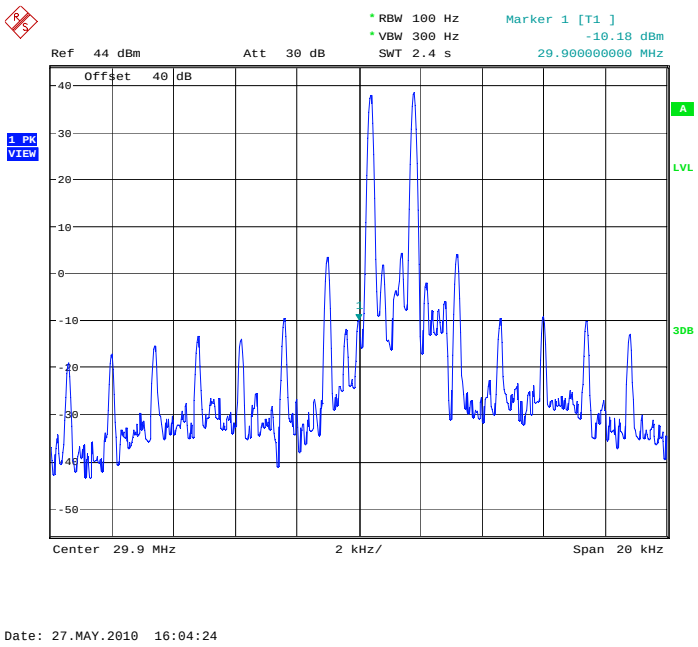
44.39 dBm – (-10.41 dBm)= 54.80 dBm

30 Watt Manpack: Carrier suppression on 14.0 MHz Channel:



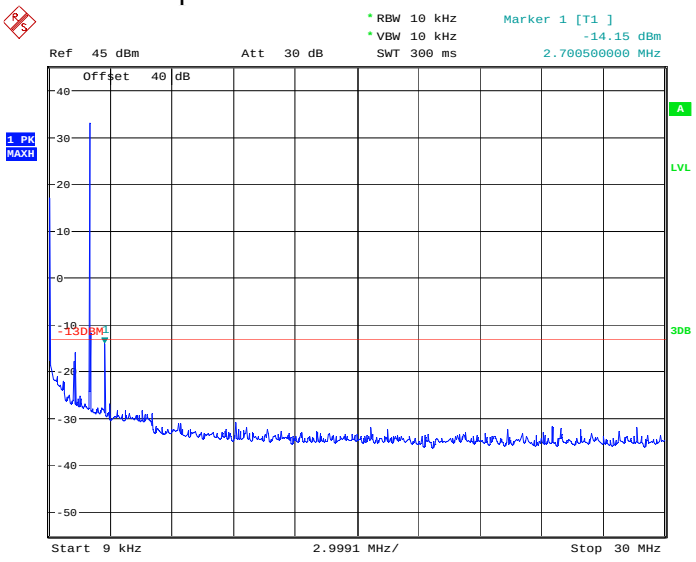
44.14 dBm – (-9.17 dBm) = 53.31dBm

30 Watt Manpack: Carrier suppression on 29.9 MHz Channel:



44.30 dBm – (-10.18 dBm) = 54.48 dBm

30 Watt Manpack: Conducted spurious emissions on 2.0 MHz Channel:



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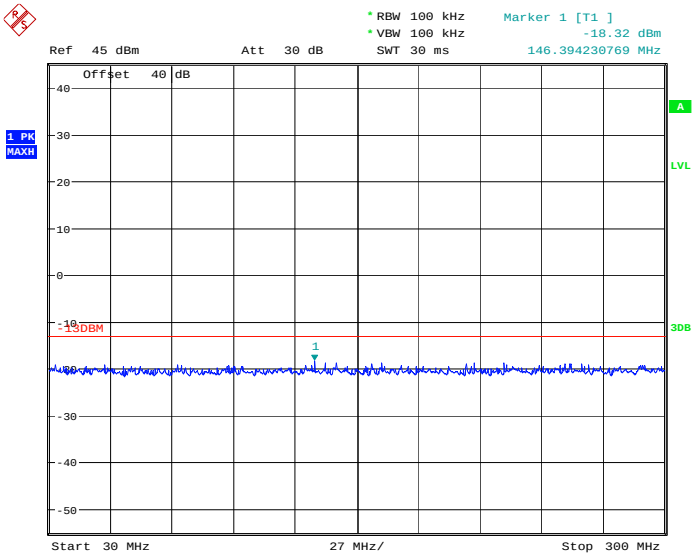
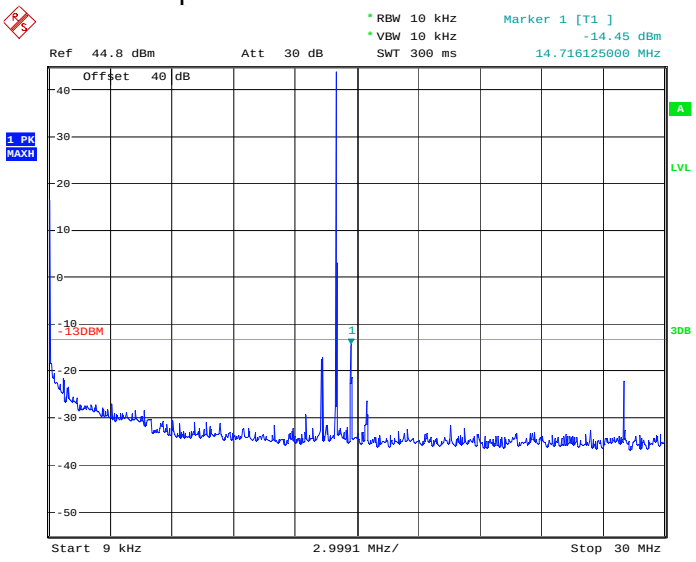


Date: 26.MAY.2010 09:43:55

30 Watt Manpack: Conducted spurious emissions on 14.0 MHz Channel:



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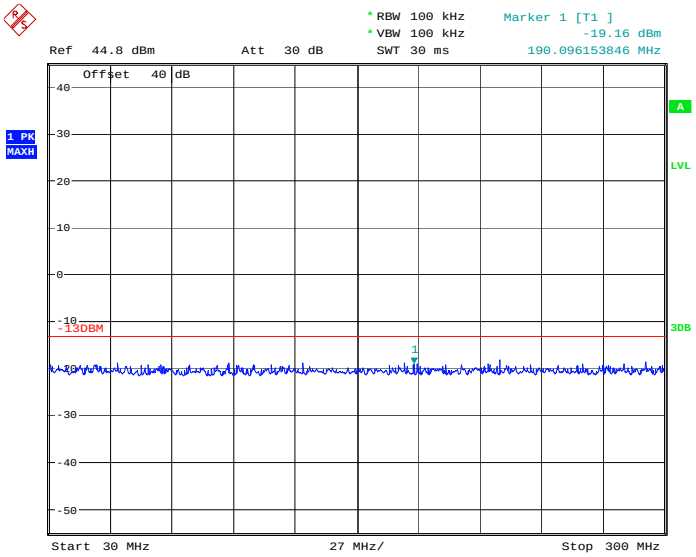

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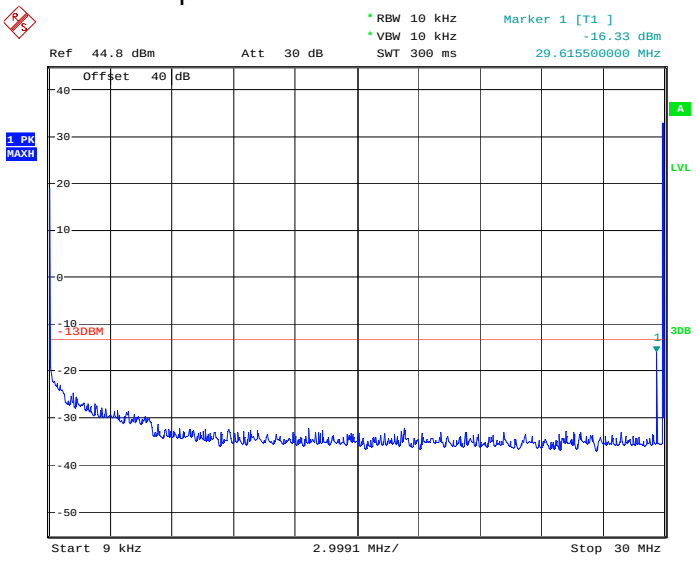
30 Watt Manpack: Conducted spurious emissions on 29.9 MHz Channel:



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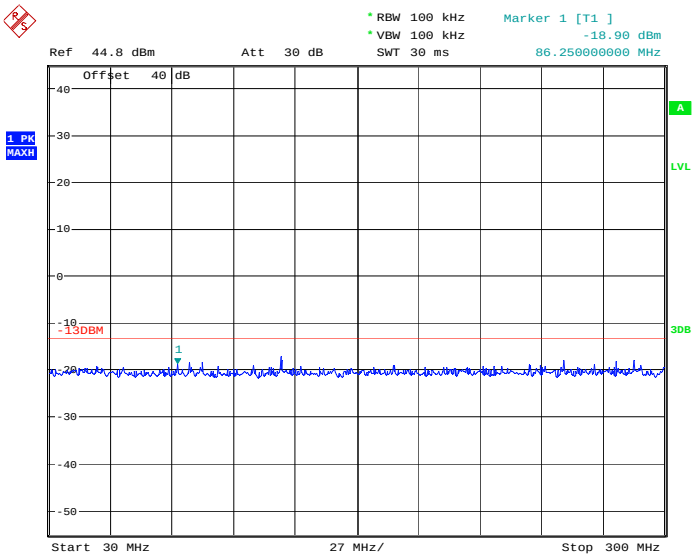

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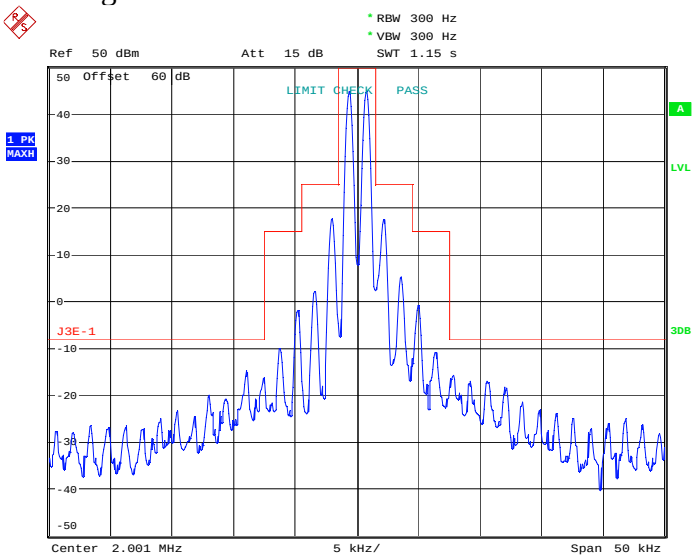
100 Watt Vehicle Docking Station: Emission mask on 2.0 MHz Channel:



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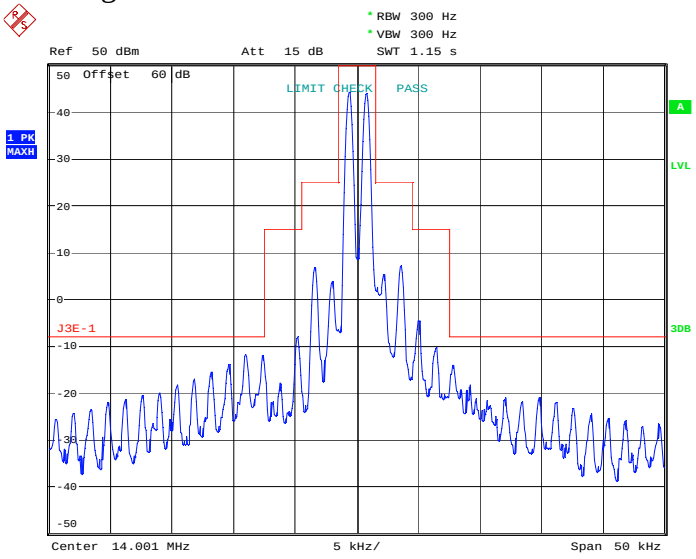
100 Watt Vehicle Docking Station: Emission mask on 14.0 MHz Channel:



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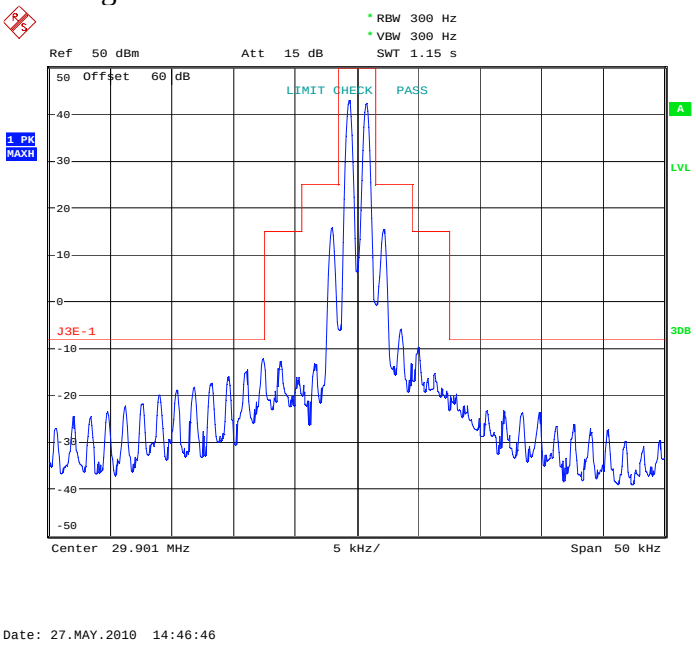
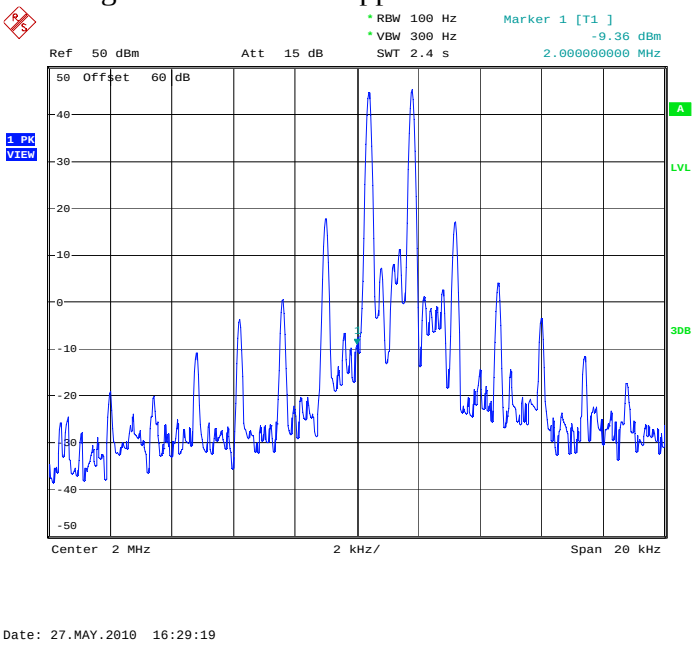
100 Watt Vehicle Docking Station: Emission mask on 29.9 MHz Channel:

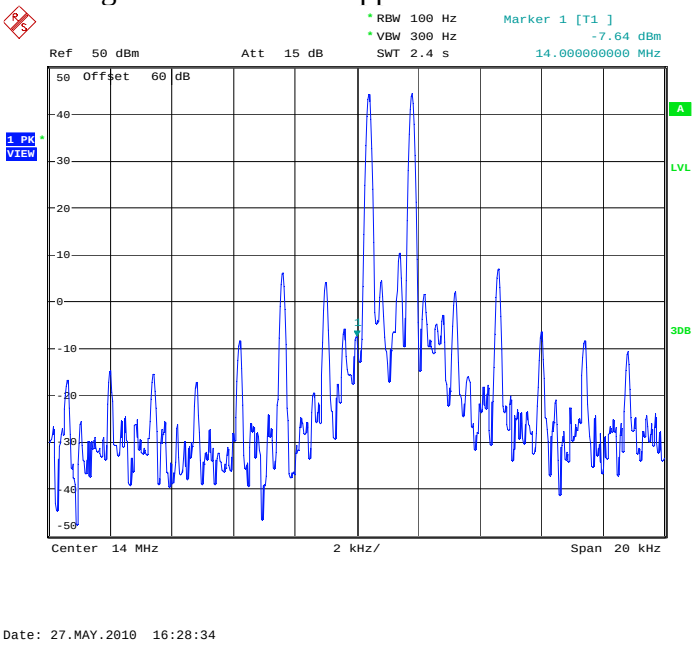


100 Watt Vehicle Docking Station: Carrier suppression on 2.0 MHz Channel:



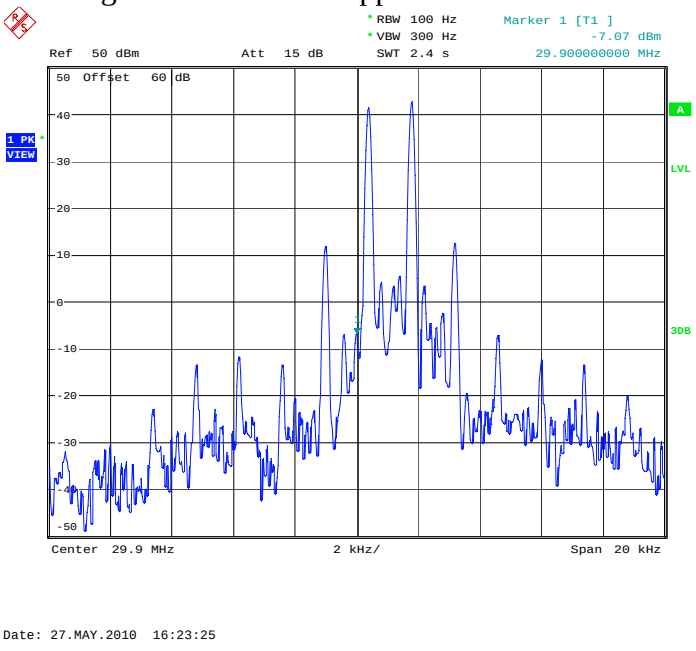
49.35 dBm – (- 9.36 dBm) = 58.71 dBm

100 Watt Vehicle Docking Station: Carrier suppression on 14.0 MHz Channel:



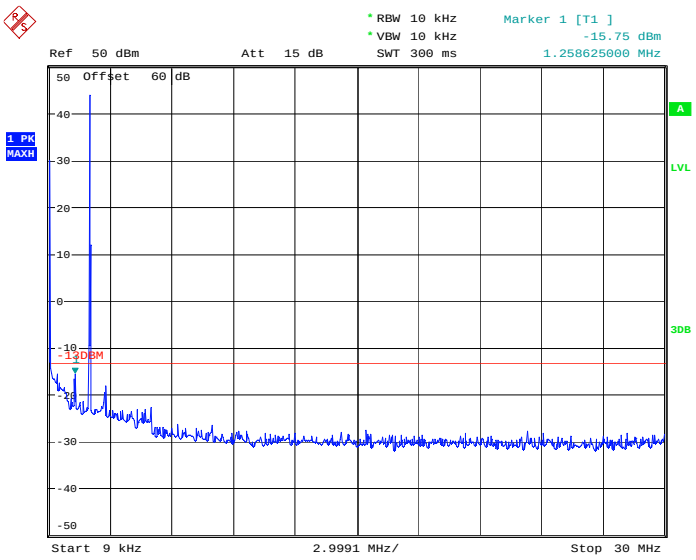
49.92 dBm – (- 7.64 dBm) = 57.56 dBm

100 Watt Vehicle Docking Station: Carrier suppression on 29.9 MHz Channel:



49.86 dBm – (-7.07dBm) = 56.93 dBm

100 Watt Vehicle Docking Station: Conducted spurious emissions on 2.0 MHz Channel:



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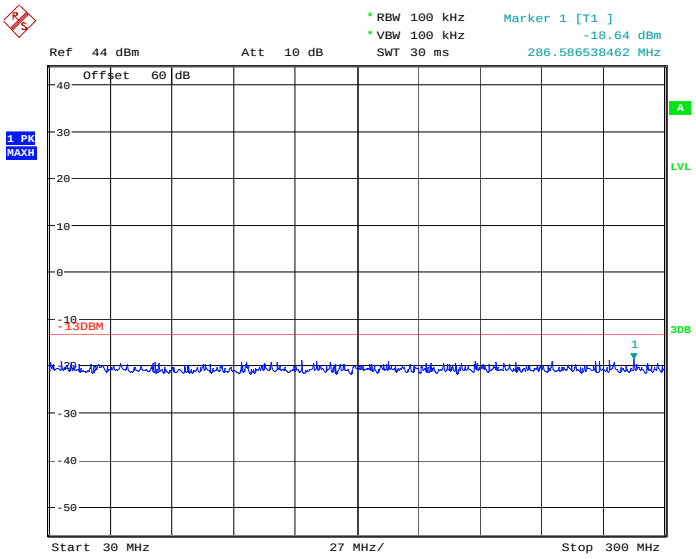
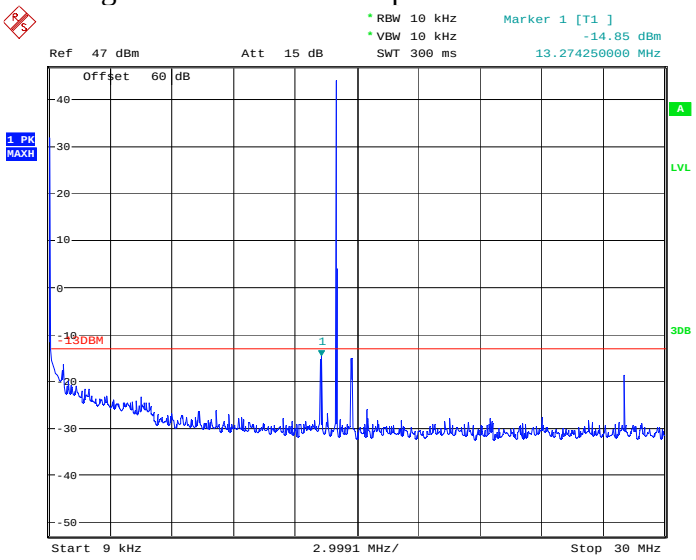
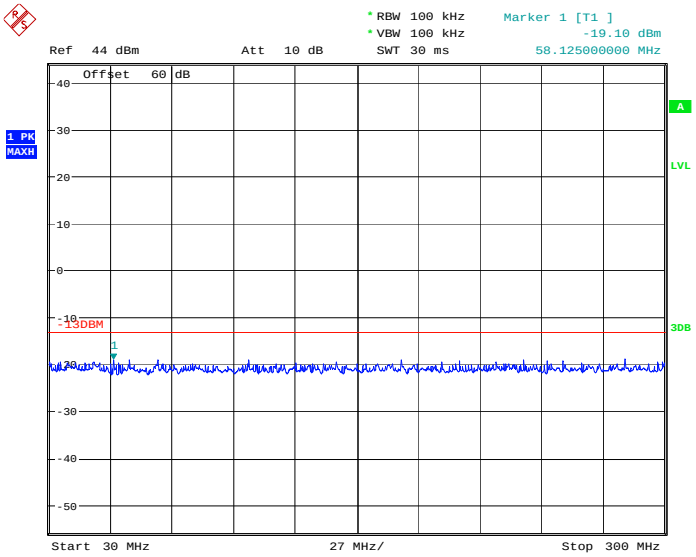


Date: 26.MAY.2010 16:01:06

100 Watt Vehicle Docking Station: Conducted spurious emissions on 14.0 MHz Channel:

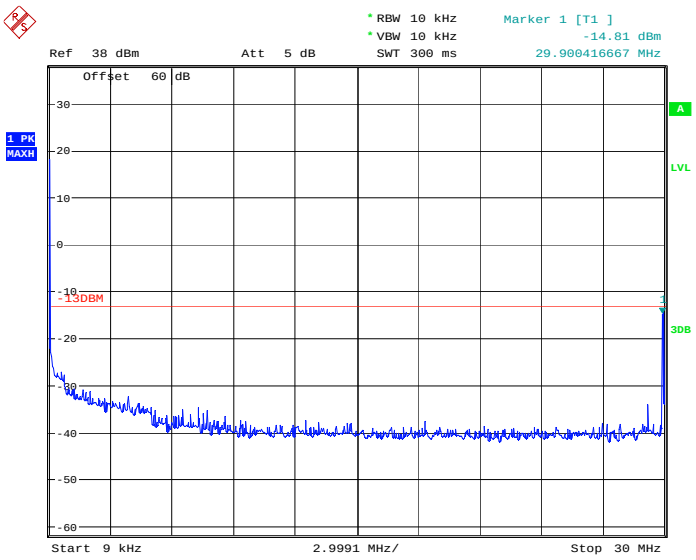


Date: 26.MAY.2010 16:07:35

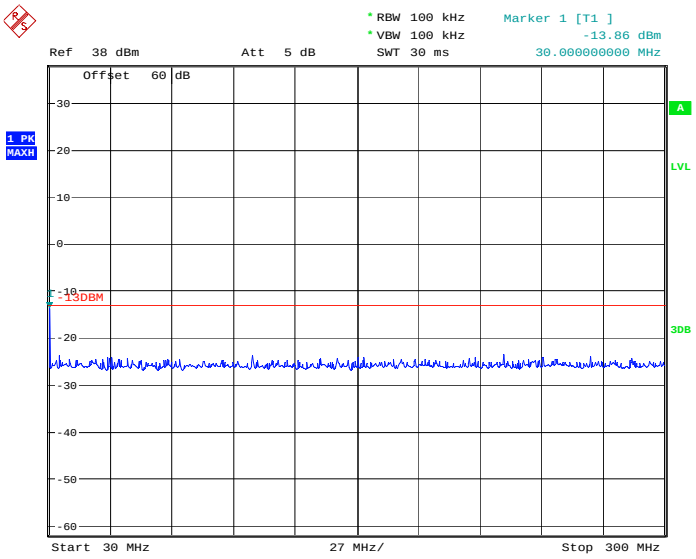


Date: 26.MAY.2010 16:08:24

100 Watt Vehicle Docking Station: Conducted spurious emissions on 29.9 MHz Channel:



Date: 26.MAY.2010 15:47:40



Date: 26.MAY.2010 15:48:53

Clause 90.210 Field Strength of spurious radiation

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere, the Table below specifies the emission masks for equipment operating in the frequency bands governed under this part.

Test Results: Pass

Additional Observations:

The Spectrum was searched from 9 kHz to the 10th Harmonic.

All measurements were performed using a Peak Detector with 10 kHz/30 kHz RBW/VBW for below 30 MHz, and 100 kHz/300 kHz RBW/VBW for 30 MHz to 1GHz at a distance of 3 meters.

30 Watt Manpack:

Channel	Frequency (MHz)	Pol. V/H	RCVD Signal (dBµV)	Sig Sub. Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
Low	140.96	V	28.72	-82.32	-53.60	-13.00	40.60
	164.44	V	27.65	-82.46	-54.81	-13.00	41.81
Mid	97.99	V	45.70	-88.76	-43.06	-13.00	30.06
	153.96	V	39.46	-81.73	-42.27	-13.00	29.27
High	89.65	V	32.47	-88.24	-55.77	-13.00	42.77
	149.79	V	33.30	-81.47	-48.17	-13.00	35.17

100 Watt Vehicle Docking Station:

Channel	Frequency (MHz)	Pol. V/H	RCVD Signal (dBµV)	Sig Sub. Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
Low	132.52	V	37.75	-83.14	-45.39	-13.00	32.39
	137.08	V	38.35	-82.70	-44.35	-13.00	31.35
Mid	69.96	V	59.90	-87.44	-27.54	-13.00	14.54
	97.99	V	55.91	-88.76	-32.85	-13.00	19.85
High	89.65	V	72.45	-88.24	-15.79	-13.00	2.79
	149.50	V	62.70	-81.50	-18.80	-13.00	5.80

Clause 90.213 Frequency Stability

a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following Table.
Minimum Frequency Stability
parts per million (ppm)

Frequency range (MHz)	Fixed and base stations 2 watts output power	Mobile stations Over power	2 watts or less output
Below 25	100	100	200
25-50	20	20	50
72-76	5	---	50
150-174	50	5	50
216-220	1.0	---	1.0
220-222	0.1	1.5	1.5
421-512	2.5	5	5
806-809	1.0	1.5	1.5
809-824	1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	0.1	1.5	1.5
902-928	2.5	2.5	2.5
929-930	1.5	---	---
935-940	0.1	1.5	1.5
1427-1435	300	300	300
Above 2450	---	---	---

For single sideband operations below 25 MHz, the carrier frequency must be maintained within 50 Hz of the authorized carrier frequency

Test Results: Pass

Additional Observations:

Low, mid and high channels were tested; only the worst-case results were presented.

30 Watt Manpack:

Test Condition	Measured Frequency (MHz)	Frequency Drift (Hz)	Limit (Hz)	Marin (Hz)
+20°C, Nominal power	14.001794	-----	-----	------
+20°C, -15% power	14.001794	0	50	50
+20°C, +15% power	14.001794	0	50	50
+50°C, Nominal power	14.001795	1	50	49
+40°C, Nominal power	14.001794	0	50	50
+30°C, Nominal power	14.001794	0	50	50
+20°C, Nominal power	14.001793	-1	50	49
+10°C, Nominal power	14.001794	0	50	50
0°C, Nominal power	14.001794	0	50	50
-10°C, Nominal power	14.001793	-1	50	49
-20°C, Nominal power	14.001792	-2	50	48
-30°C, Nominal power	14.001792	-2	50	48

100 Watt Vehicle Docking Station:

Test Condition	Measured Frequency (MHz)	Frequency Drift (Hz)	Limit (Hz)	Marin (Hz)
+20°C, Nominal power	14.001794	-----	------	------
+20°C, -15% power	14.001794	0	50	50
+20°C, +15% power	14.001794	0	50	50
+50°C, Nominal power	14.001795	1	50	49
+40°C, Nominal power	14.001794	0	50	50
+30°C, Nominal power	14.001794	0	50	50
+20°C, Nominal power	14.001793	-1	50	49
+10°C, Nominal power	14.001794	0	50	50
0°C, Nominal power	14.001794	0	50	50
-10°C, Nominal power	14.001793	-1	50	49
-20°C, Nominal power	14.001792	-2	50	48
-30°C, Nominal power	14.001792	-2	50	48

Clause 2.1047 Modulation Characteristics

(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.

(b) Equipment which employs modulation limiting: A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

(c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power: A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.

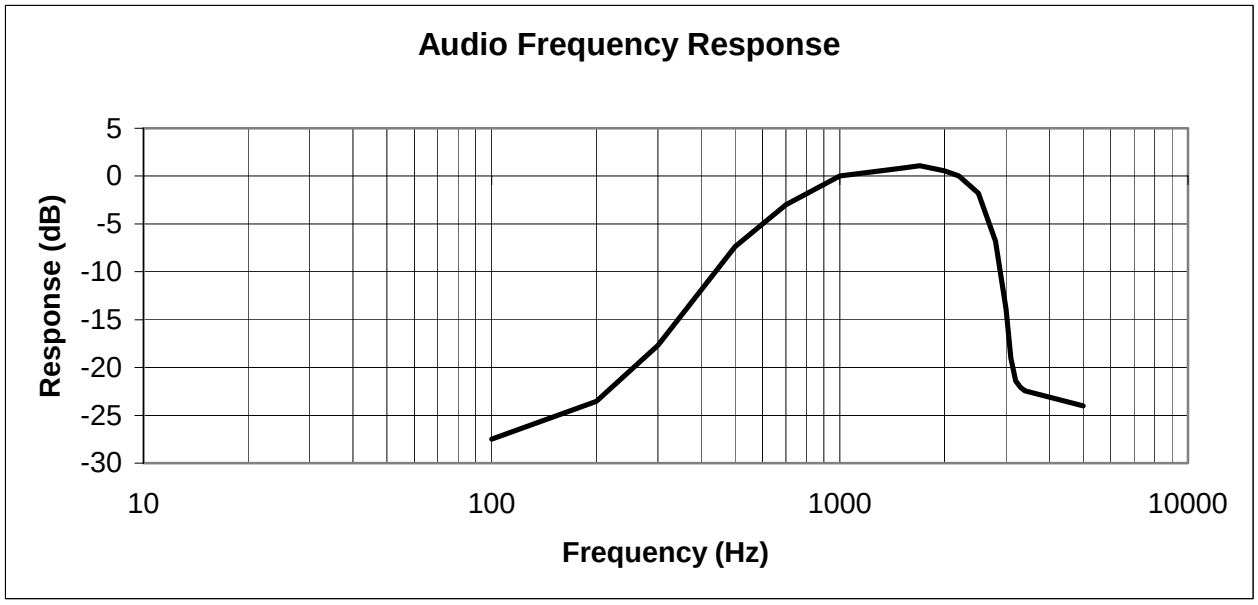
(d) Other types of equipment: A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

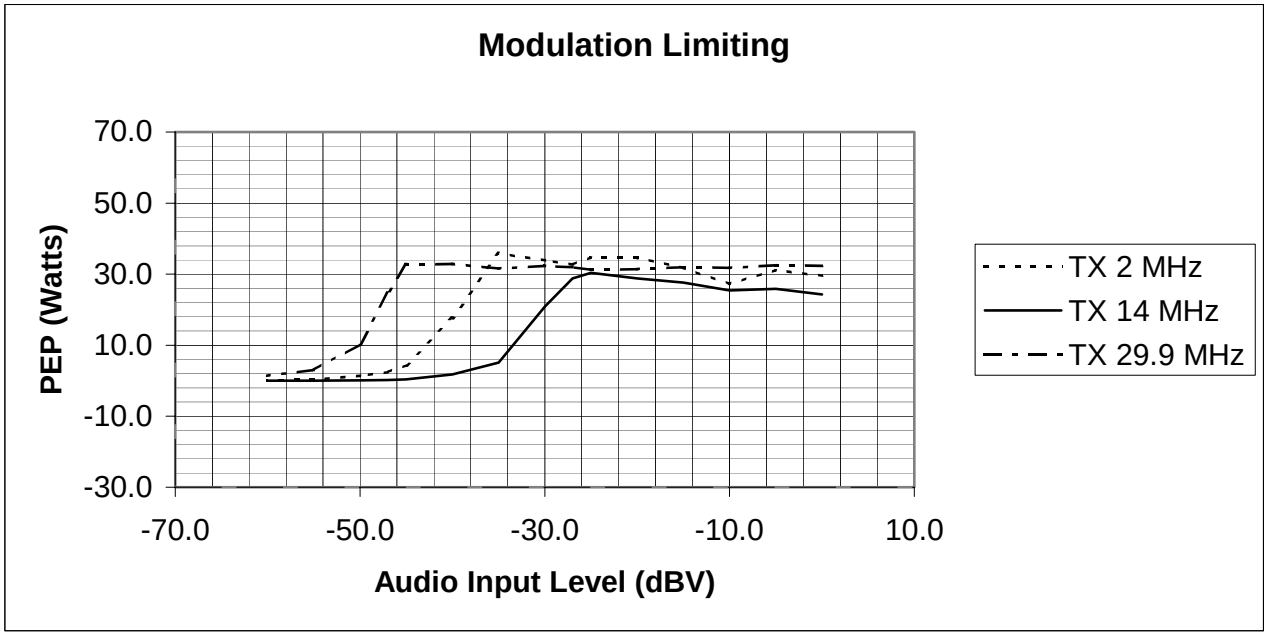
Test Results: Pass

Additional Observations:

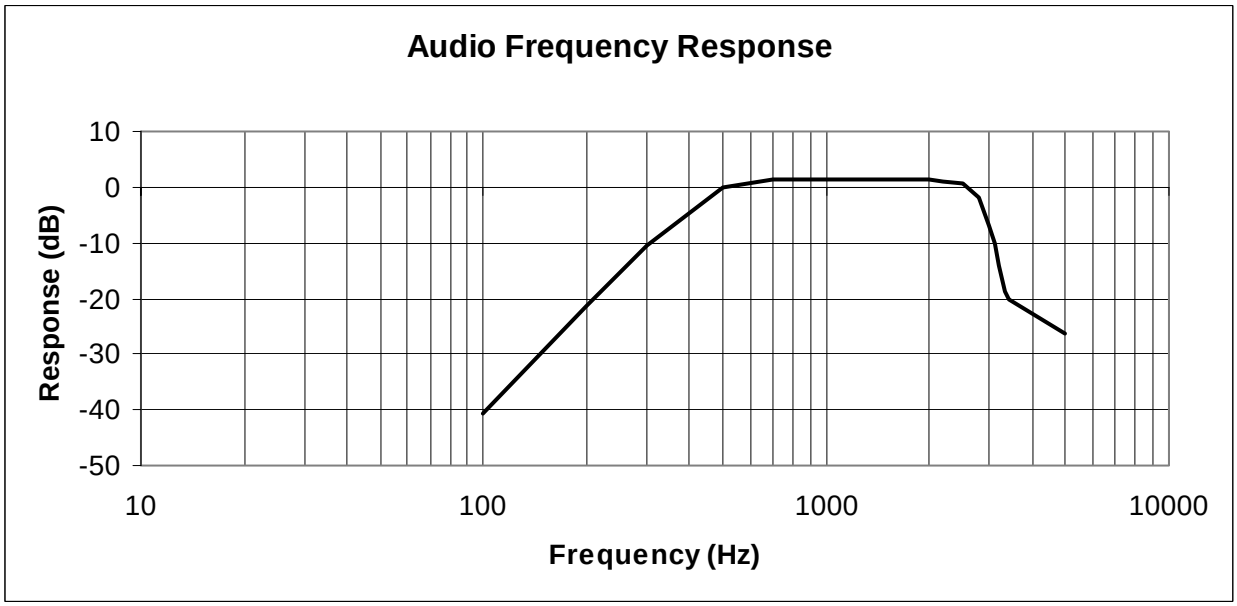
Refer to below plots.

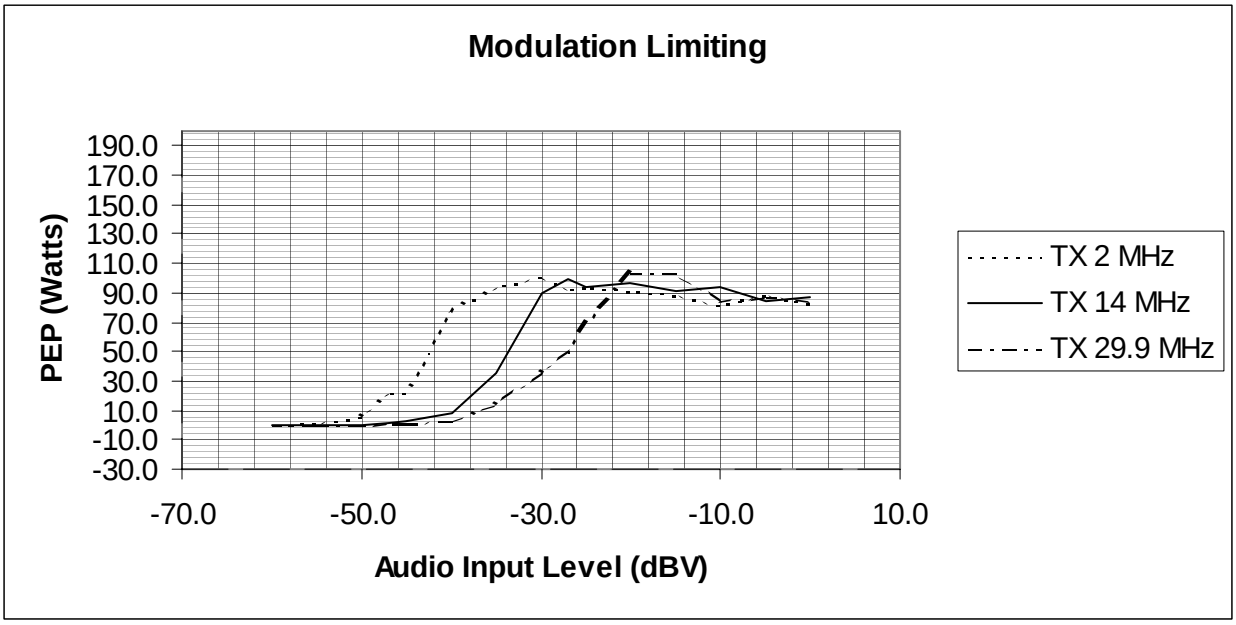
30 Watt Manpack:





100 Watt Vehicle Docking Station:

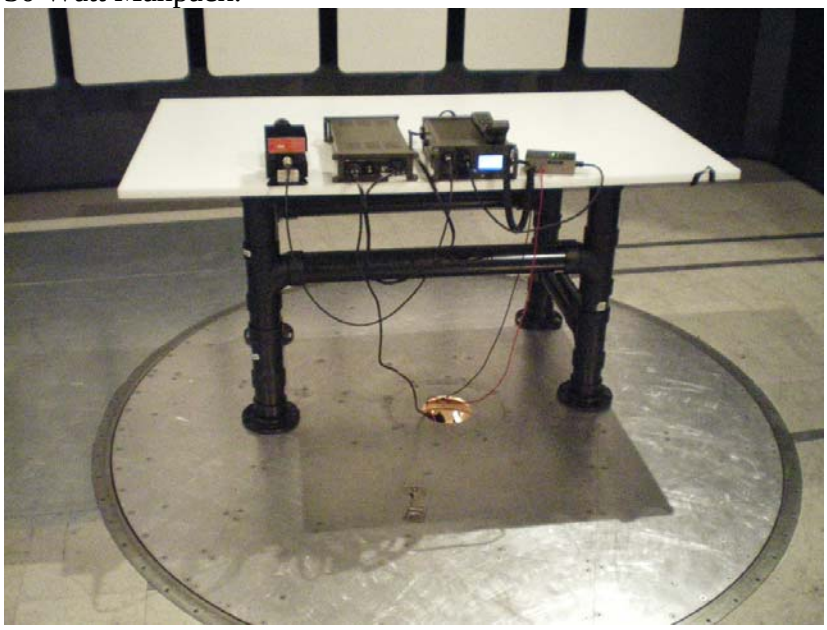




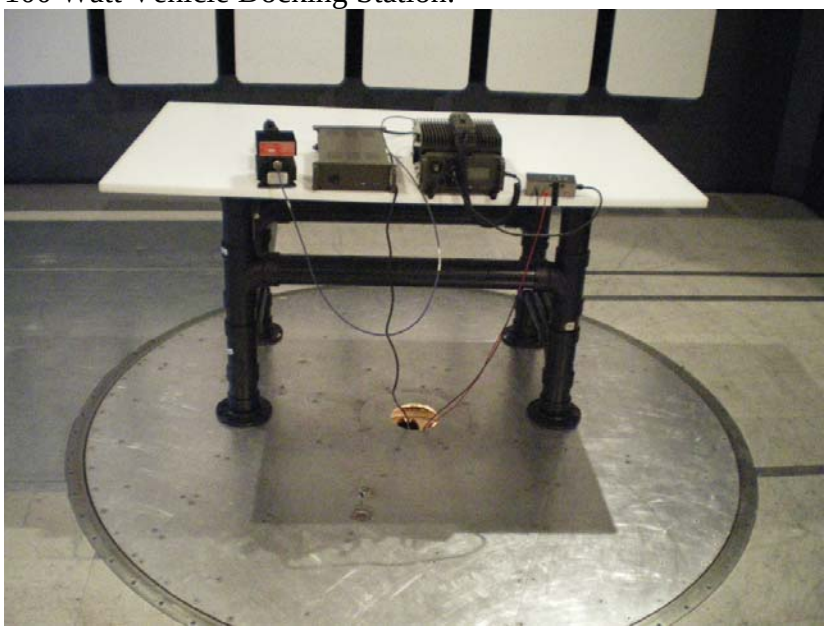
Appendix B : Setup Photographs

Radiated Spurious Emissions Setup:

30 Watt Manpack:

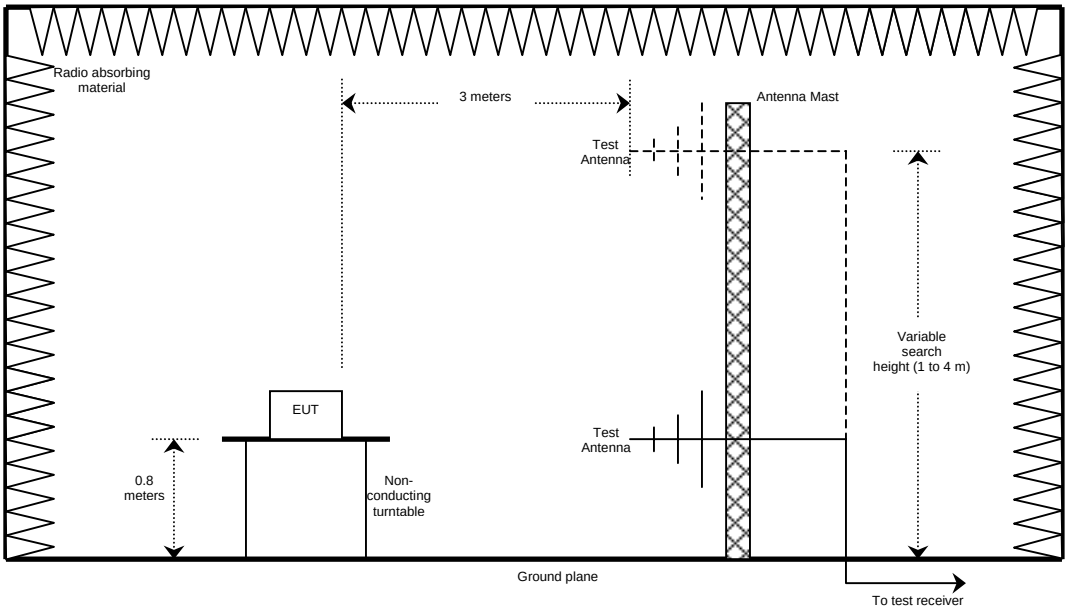


100 Watt Vehicle Docking Station:

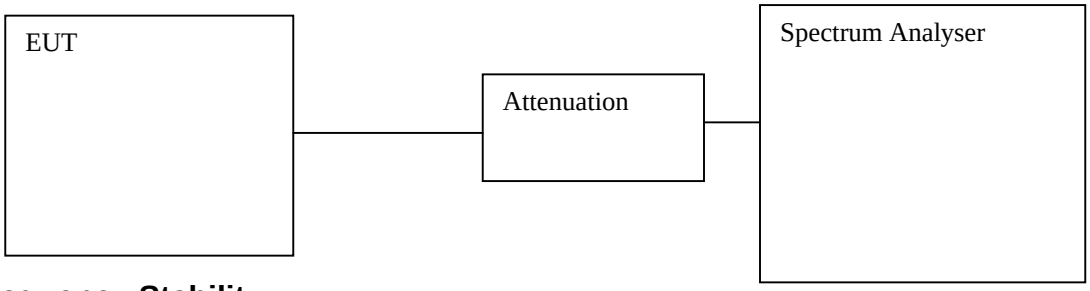


Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions, Output power, Occupied Bandwidth



Frequency Stability