



Engineering and Testing for EMC and Safety Compliance

## Class II Permissive Change Report

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**Model: P5400 VHF Portable Radio**

**FCC ID: OWDTR-0044-E**  
**IC: 3636B-0044**

**June 29, 2010**

Standards Referenced for this Report	
Part 2: 2009	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2009	Private Land Mobile Radio Services
ANSI TIA-603-C-2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
RSS-119 Issue 10 2010	Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41- 960 MHz

Frequency Range (MHz)	Rated Transmit Power (W) (Conducted)	Frequency Tolerance (ppm)	Emission Designator
150.8–173.4	5.0/0.5	0.55	16K0F3E (Analog Voice; WB)
150.8–173.4	5.0/0.5	0.55	11K0F3E (Analog Voice; NB)
150.8–173.4	5.0/0.5	0.55	15K6F1D (Digital 2-FSK (9600 Data) WB)
150.8–173.4	5.0/0.5	0.55	15K6F1E (Digital Voice 2-FSK (9600 Data) WB)
150.8–173.4	5.0/0.5	0.55	10K8F1D (Digital 2-FSK (9600 Data) NB)
150.8–173.4	5.0/0.5	0.55	10K8F1E (Digital 2-FSK (9600 Data Voice) NB)
150.8–173.4	5.0/0.5	0.55	7K80F1D (Digital 2-FSK (4800 Data) NB)
150.8–173.4	5.0/0.5	0.55	7K80F1E (Digital 2-FSK (4800 Data Voice) NB)
150.8–173.4	5.0/0.5	0.55	8K40F1D (Digital C4FM (9600 Data) NB)
150.8–173.4	5.0/0.5	0.55	8K40F1E (Digital C4FM (9600 Data Voice) NB)
150.8–173.4	5.0/0.5	0.55	17K1F1D/E (Digital 4-FSK (19200 Data Voice) WB)

**Report Prepared by Test Engineer: Daniel W. Baltzell**

Document Number: 2010120

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*These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.*

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## 1 General Information

The following Class II Permissive Change Report is prepared on behalf of **Harris Corporation** in accordance with the Federal Communications Commission and Industry Canada rules and regulations. The Equipment Under Test (EUT) was the **P5400 VHF Portable Radio, FCC ID: OWDTR-0044-E, IC: 3636B-0044**. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with the applicable FCC Rules and Regulations in CFR 47. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

### 1.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia, 20170. This site has been fully described in a report submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

### 1.2 Related Submittal(s)/Grant(s)

This is a Class II Permissive Change which adds emission designators, 17K1F1D and 17K1F1E, for the Wide Band OpenSky Trunking Protocol (WBOTP). The original certification was granted on March 2, 2008.

## 2 Tested System Details

The test sample was received on June 14, 2010. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

Note that the testing covers both the System and Scan versions of the P5400. The Scan version is a limited version of the radio with fewer front panel buttons. The radios are electrically identical.

**Table 2-1: Test System Details**

<b>Model Tested</b>	P5400 VHF Portable Transceiver
<b>Frequency Band</b>	150.8–173.4 MHz
<b>Modulation Type</b>	4-level Frequency Shift Keying (FSK)
<b>Channel Step Size</b>	6.25 kHz
<b>Channel Bandwidth</b>	12.5 kHz
<b>Primary Power</b>	7.5 VDC
<b>Rated Transmitter Output Power</b>	Switchable between 0.5-5 W
<b>Duty Cycle</b>	100% maximum

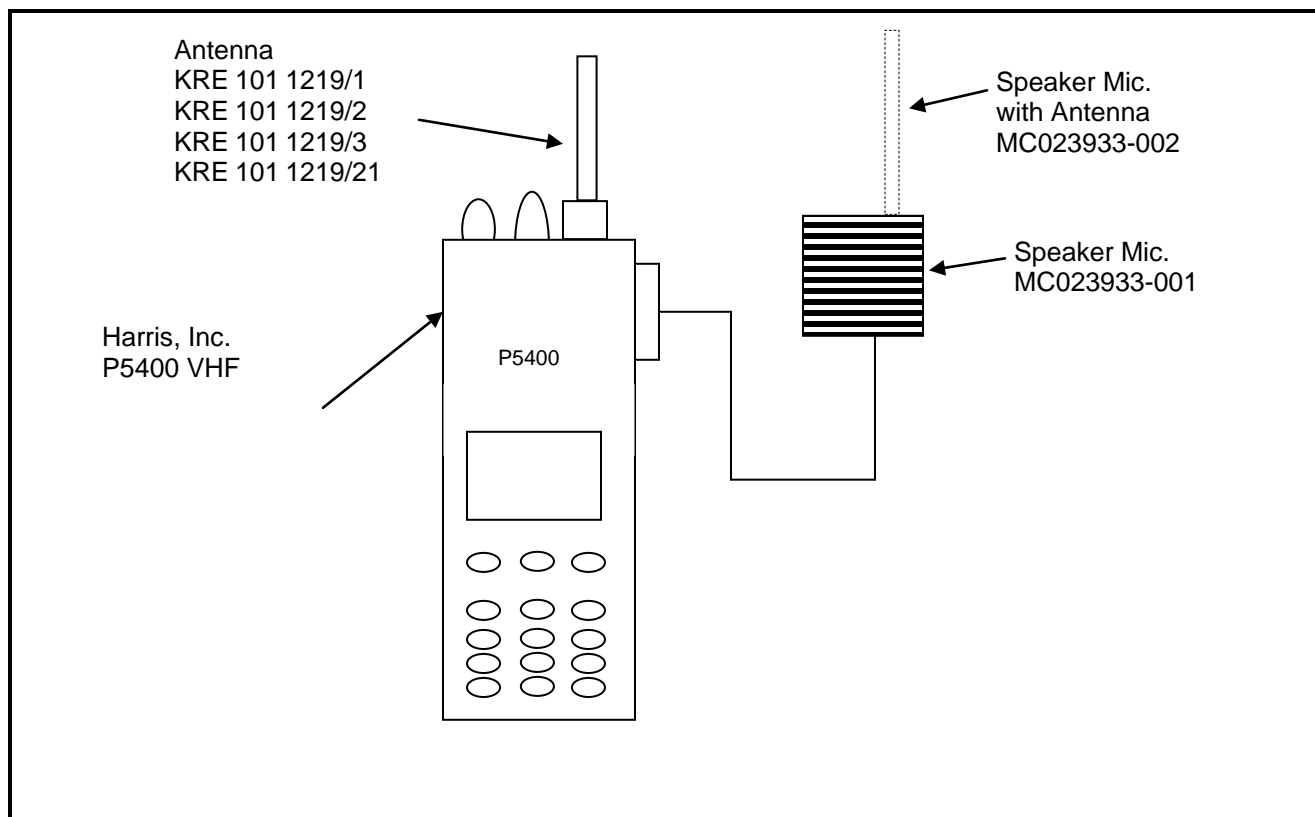
**Table 2-2: Equipment Under Test (EUT)**

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
VHF Portable Radio	Harris Corporation	RU-123550-012 (System version)	FMV-010	OWDTR-0044-E	19570
Battery	Harris Corporation	NiMH	BT-023406-003	N/A	N/A
Battery	Harris Corporation	NiCd	BT-023406-001	N/A	N/A
Battery	Harris Corporation	Li-Ion	BT-023406-005	N/A	N/A
Microphone	Harris Corporation	N/A	MC023933-001	N/A	N/A
Microphone	Harris Corporation	N/A	MC023933-002	N/A	N/A
Antenna	Harris Corporation	Spring Whip	KRE 101 1219/1	N/A	N/A
Antenna	Harris Corporation	Spring Whip	KRE 101 1219/1	N/A	N/A
Antenna	Harris Corporation	Spring Whip	KRE 101 1219/2	N/A	N/A
Antenna	Harris Corporation	Spring Whip	KRE 101 1219/2	N/A	N/A
Antenna	Harris Corporation	Spring Whip	KRE 101 1219/3	N/A	N/A
Antenna	Harris Corporation	Spring Whip	KRE 101 1219/3	N/A	N/A
Antenna	Harris Corporation	Spring Whip	KRE 101 1219/21	N/A	N/A
Antenna	Harris Corporation	Spring Whip	KRE 101 1219/21	N/A	N/A

**Table 2-3: Support Equipment**

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Audio Test Box	Harris Corporation	MATQ-03424	N/A	N/A	17870
Audio Test Cable	Harris Corporation	CA-023407-002	N/A	N/A	17869

**Figure 2-1: Configuration of Tested System**



### 3 FCC Rules and Regulations Part 90 §90.1215(a) and Part 2 §2.1046(a): Peak Output Power

#### 3.1 Test Procedure

ANSI TIA-603-2004, section 2.2.1.

The EUT was connected with a power sensor/meter through an appropriate 50 ohm attenuator. Attenuator loss was accounted for.

#### 3.2 Test Data

**Table 3-1: RF Power Output: Unmodulated Carrier Output Power**

Frequency (MHz)	RF Power Measured (Watt)*
150.8	5.6
162.0	5.8
173.4	5.8

\* conducted antenna port power

**Table 3-2: RF Power Output (Low Power): Carrier Output Power (Unmodulated)**

Frequency (MHz)	RF Power Measured (Watt)*
150.8	0.525
162.0	0.537
173.4	0.537

\* conducted antenna port power

**Table 3-3: RF Power Output (Rated Power)**


Frequency (MHz)	High Power Rated (W)	Low Power Rated (W)*
150.8-173.4	5.0	0.5

\* conducted antenna port power

**Table 3-4: Test Equipment for Testing RF Power Output - Conducted**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	11/18/10
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	11/18/10
901140	Weinschel Corp.	47-10-34 DC-18GHz	Attenuator, 50W 10dB	BK6203	2/17/11

#### Test Personnel:

Daniel W. Baltzell		June 25, 2010
Test Engineer	Signature	Date of Tests

#### 4 FCC Rules and Regulations Part 2 §2.1051: Spurious Emissions at Antenna Terminals; Part 90 §90.210: Emissions Masks; RSS-119 §4.2: Transmitter Unwanted Emissions

##### 4.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.13.

The transmitter is terminated with a 50  $\Omega$  load and interfaced with a spectrum analyzer. The device uses digital modulation modulated to its maximum extent using a pseudo random data sequence of 19200 bps for WBOTF (Wide Band OpenSky Trunking Protocol) mode.

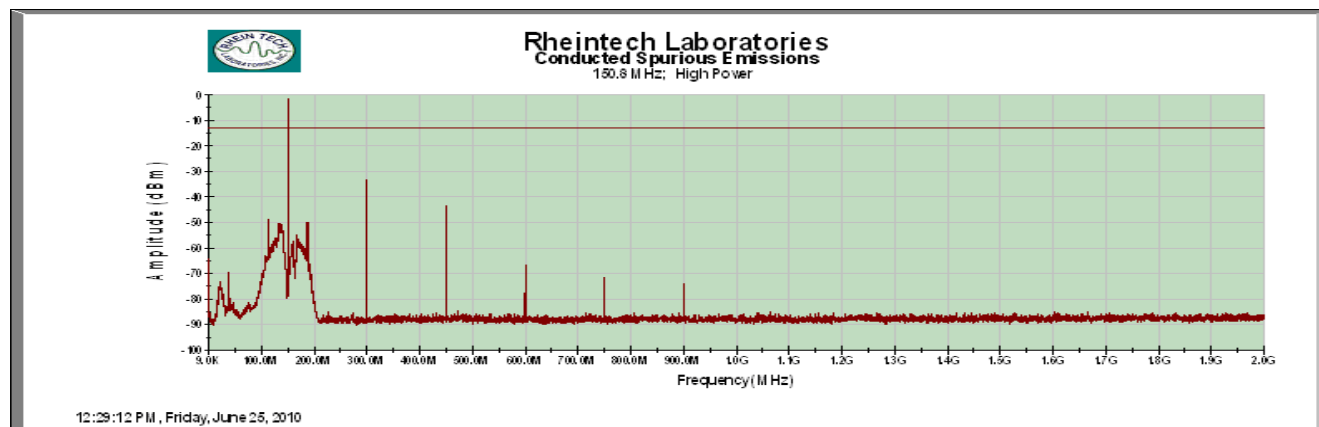
##### 4.2 Test Data

Frequency range of measurement per Part 2.1057: 9 kHz to 10x $F_c$ .

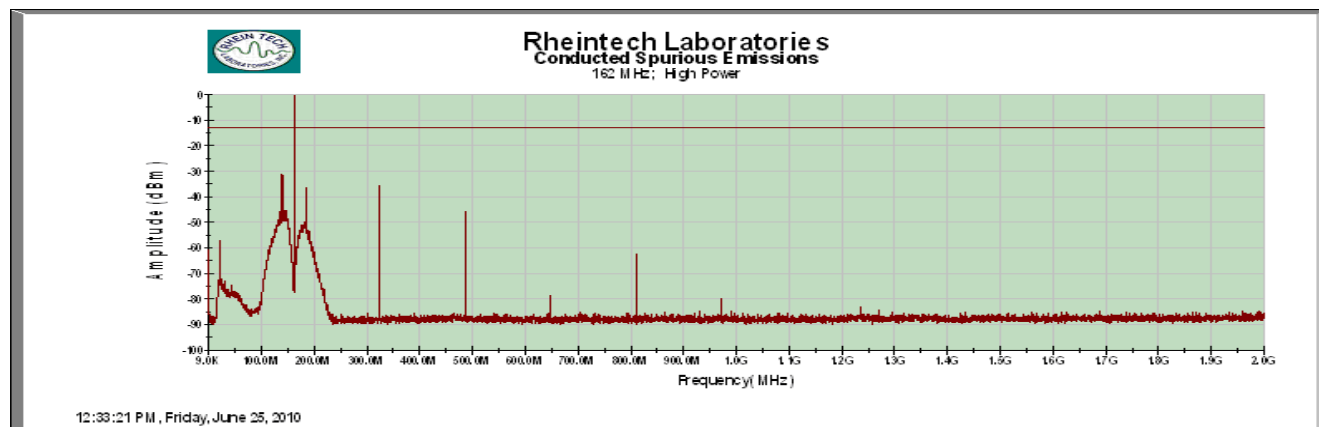
Limit:  $P(\text{dBm}) - (43 + 10 \times \text{LOG } P(\text{W}))$

The worst case (unwanted emissions) channels are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

**Plot 4-1: Conducted Spurious Emissions; 150.8 MHz**

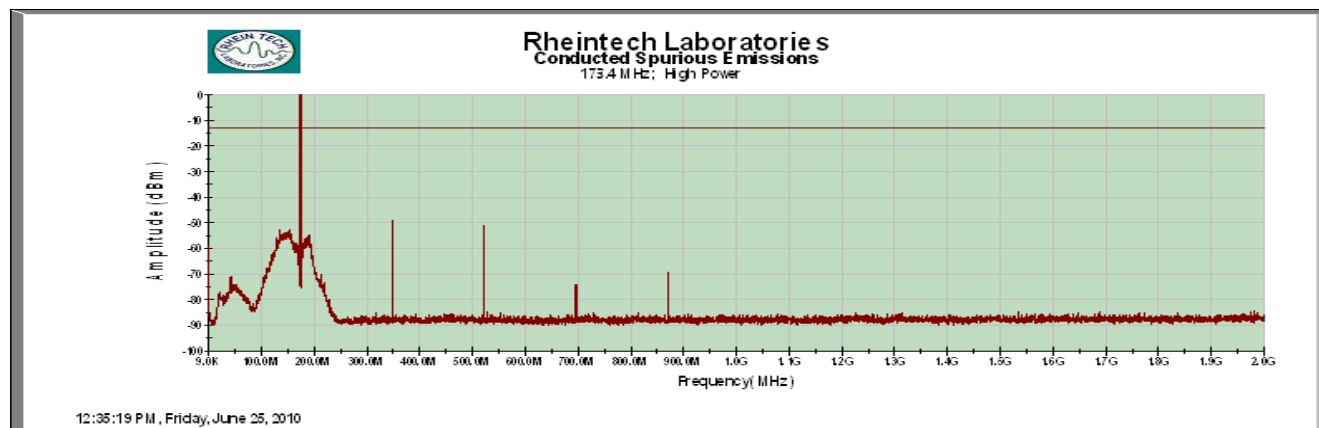


**Plot 4-2: Conducted Spurious Emissions; 162 MHz**





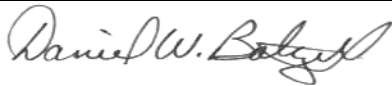
**Plot 4-3: Conducted Spurious Emissions; 173.4 MHz**



**Table 4-1: Test Equipment for Testing Conducted Spurious Emissions**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	11/10/10
901140	Weinschel Corp.	47-10-34 DC-18GHz	Attenuator, 50W 10dB	BK6203	2/17/11
901129	Par Electronics	188-174 (25W)	VHF Notch Filters	N/A	3/10/12

**Test Personnel:**

Daniel W. Baltzell		June 25, 2010
Test Engineer	Signature	Date of Tests

## 5 FCC Rules and Regulations Part §2.1049(c)(1); §90.210; RSS-119 5.8: Occupied Bandwidth

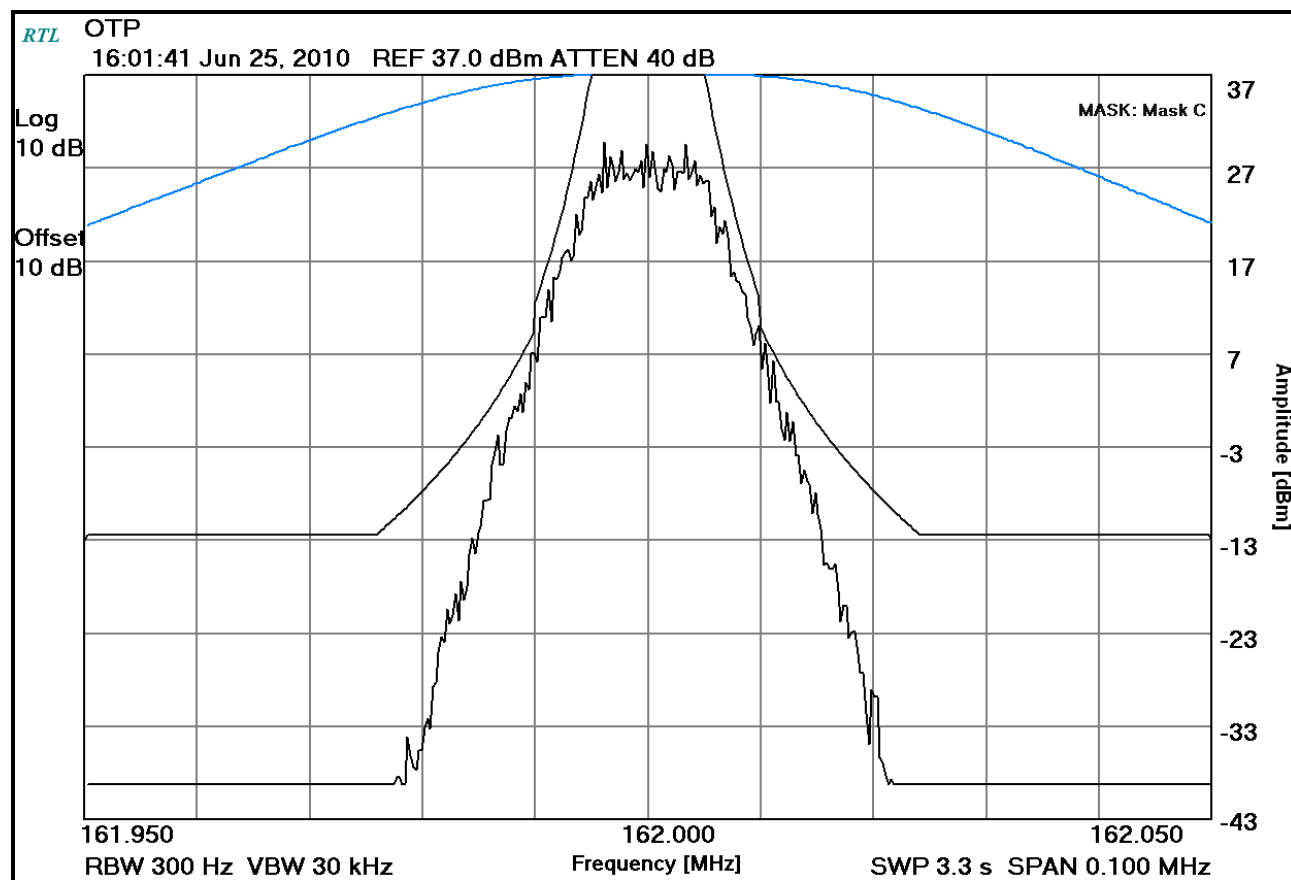
### 5.1 Test Procedure

Device with digital modulation: Modulated to its maximum extent using a pseudo random data sequence – 19,200 bps.

ANSI/TIA/EIA-603-2004, Section 2.2.11.

### 5.2 Test Data

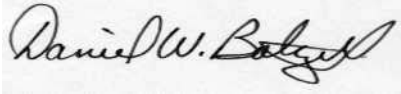
**Plot 5-1: Occupied Bandwidth – 162 MHz; Mask C; Wide Band; 4-Level FSK; OTP**



**Table 5-1: Test Equipment for Testing Occupied Bandwidth**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901140	Weinschel Corp.	47-10-34 DC-18GHz	Attenuator, 50W 10dB	BK6203	2/17/11
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9kHz-12.8GHz)	3826A00144	11/23/10

**Test Personnel:**

Dan Baltzell		June 25, 2010
Test Engineer	Signature	Date of Test

## 6 FCC Rules and Regulations Part 90 §90.210(g) and Part 2 §2.1053(a): Field Strength of Spurious Radiation; RSS-119 §4.2: Unwanted Emissions

### 6.1 Test Procedure

ANSI TIA-603-C-2004, section 2.2.12.

The device uses digital modulation modulated to its maximum extent using a pseudo-random data sequence of 19200 bps for WBOTP (Wide Band OpenSky Trunking Protocol) mode.

The spurious emissions levels were measured and the device under test was replaced by a substitution antenna connected to a signal generator. This maximized signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half wave dipole.

### 6.2 Test Data

#### 6.2.1 CFR 47 Part 90.210 Requirements

The worst-case emissions test data are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded per FCC Part 2.1057(c).

Limit:  $P(\text{dBm}) - (43 + 10 \times \text{LOG } P(\text{W}))$

**Table 6-1: Field Strength of Spurious Radiation: 162 MHz – 17K1F1D/E (WBOTP)**


**Conducted Power= 37.6 dBm; 5.8W; Limit:  $43+10\text{Log}P= 50.6 \text{ dBc}$**

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Antenna Gain (dBd)	EIRP (dBc)	Margin (dB)
324.0	45.4	-67.0	0.5	1.6	103.5	-52.9
486.0	46.4	-61.5	1.0	1.5	98.6	-48.0
648.0	43.9	-60.8	1.6	1.3	98.7	-48.1
810.0	40.5	-60.2	1.9	1.0	98.7	-48.1
972.0	43.1	-58.4	2.3	1.7	96.5	-45.9
1134.0	34.6	-66.5	2.5	4.4	102.2	-51.6
1296.0	36.0	-63.5	2.8	5.1	98.7	-48.1
1458.0	32.7	-64.8	3.0	6.2	99.2	-48.6
1620.0	36.2	-62.7	3.3	6.7	96.9	-46.3

**Table 6-2: Test Equipment for Testing Field Strength of Spurious Radiation**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	11/10/10
900928	Hewlett Packard	83752A	Synthesized Sweeper, (0.01 - 20 GHz)	3610A00866	2/17/11
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	12/12/10
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	6/14/11
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	6/14/11
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1054	6/14/11
901262	ETS	3160-9	Double ridged Guide Antenna (1 - 18 GHz)	6748	5/1/11
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	4/5/11
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS-09302008	RF cable, 20'	NA	10/19/10
901517	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	10/19/10
900932	Hewlett Packard	8449B OPT H02	Preamplifier 1-26.5 GHz	3008A00505	2/22/11
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	4/10/11
901129	Par Electronics	188-174 (25W)	VHF Notch Filters	N/A	3/10/12

**Test Personnel:**

Daniel W. Baltzell		June 26, 2010
Test Engineer	Signature	Date of Test

## 7 FCC Rules and Regulations Part 2 §2.202: Necessary Bandwidth and Emission Bandwidth

Type of Emission: F1D, F1E (the addition of this emission is the purpose of this Class 2 report).

### Digital Data – 4 level FSK; 19200 bps; Wide Band; 25 kHz Channel Spacing

#### Calculation:

Data rate in bps (R) = 19200

Peak deviation of carrier (D) = +/-3.75 kHz

Number of states in each symbol (S) = 2

$B_n = [19200 / \log_2(4) + 2(3750)(1)] = 17.100 \text{ kHz}$

Emission designator: 17K1F1D, 17K1F1E

## 8 Conclusion

The data in this measurement report shows that the **Harris Corporation Model P5400 VHF Portable Radio, FCC ID: OWDTR-0044-E, IC: 3636B-0044**, complies with all the applicable requirements of FCC Parts 90, 15 and 2 and Industry Canada RSS-119.