FCC PART 15.245

EMI MEASUREMENT AND TEST REPORT

For

TAKEX AMERICA, INC.

1330 ORLEANS DRIVE
SUNNYVALE, CA 94089

FCC ID: TO5MW-50

This Report Concerns:	Equipment Type:
☒ Original Report	24GHz Microwave Sensor

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Report No.:	R0507275
Report Date:	2005-10-13
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *TAKEX AMERICA, INC.* product, Model: *MW-50* or the "EUT" as referred to in this report is a 24GHz Microwave Sensor which measures approximately 4.25”L x 4.25”W x 9”H.

** The test data gathered are from production sample, serial number: 0001B provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of *TAKEX AMERICA, INC.* in accordance with Part 2, Subpart J, Part 15, Subparts A , B and C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for Radiated Emission.

Related Submittal(s)/Grant(s)

No Related Submittals

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 - 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp.

Test Facility

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA with registration number:90464.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to ANSI C63.4-2003.

Schematics and Block Diagram

Please refer to Appendix A.

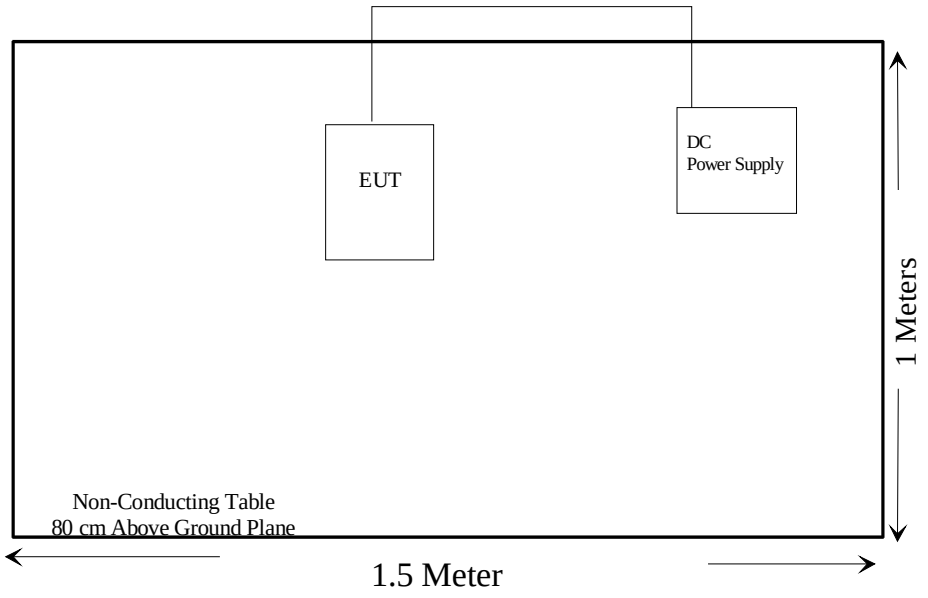
Equipment Modifications

No modifications were made to the EUT.

Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
Hewlett Packard	12 Volt DC Power Supply	HP 6236B	None	None

Test Setup Block Diagram



SUMMARY OF TEST RESULTS FOR FCC PART 15.245

Results reported relate only to the product tested.

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§15.245, §15.209, §15.205	Radiated Emission	Pass

§15.203 - ANTENNA REQUIREMENT

Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Connected Construction

The antenna connector is designed with permanent attachment and no consideration of replacement.

§15.24,5 §15.205 & §15.209 - SPURIOUS RADIATED EMISSION

Measurement Uncertainty

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ±4.0 dB.

According to §15.205, except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
[1]0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2655 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.57725	240 – 285	3345.8 – 3358	36.43 – 36.5
13.36 – 13.41	322 – 335.4	3600 – 4400	([2])

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510MHz
[2] Above 38.6

Except as provided in paragraph (d) and (e), the filed strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

According to §15.209, the device shall meet radiated emission general requirements.

Except for Class A device, the filed strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (Microvolts/meter)	(dBμV/meter)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209 limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The EUT was connected to the power adapter which is connected with 120Vac/60Hz power source.

Spectrum Analyzer Setup

According to FCC Rules, 47 CFR, Section 15.33, the frequency was investigated from 30 to 25000 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Range	***RBW***	***Video B/W***
Below 30MHz	10kHz	10kHz
30 – 1000MHz	100kHz	100kHz
Above 1000MHz	1MHz	1MHz

For Average measurement: RBW = 1MHz, VBW = 10Hz (above 1000MHz)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	11/10/2004
HP	Amplifier, Pre	8447D	2944A10198	8/20/2004
HP	Amplifier, Pre, Microwave	8449B	3147A00400	6/14/2004
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	4/20/2005
Agilent	Mixer, Harmonic	11970V-H80	2521A01640	N/R
Agilent	Mixer, Harmonic	11970W	2521A01603	N/R
Wisewave	Antenna, Rectangular Gain Horn	ARH-1023-02	11648-01	5/29/2005
Wisewave	Antenna, Rectangular Gain Horn	ARH-1523-02	11648-01	5/29/2005
Wisewave	Antenna, Rectangular Gain Horn	ARH-1923-02	11648-01	5/29/2005
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100044	9/29/2004
Sunol Sciences	Antenna	JB1	A013105-3	2/11/2005

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

For the radiated emissions test, the EUT, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**Qp**" in the data table.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - FCC 15.209 Limit

Environmental Conditions

Temperature:	25° C
Relative Humidity:	46%
ATM Pressure:	1018 mbar

**The testing was performed by Kevin Lee on 2005-09-09.*

Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.245, and had the worst margin of:

TX:
-6.33 dB at **24110.0000 MHz**, Low Channel

-10.52 dB at **48.3400 MHz**, High Channel

RX:
-13.0 dB at **283.05 MHz**, Low Channel

-14.8 dB at **171.64 MHz**, High Channel

TX, 1GHz -120GHz , Low channel. : 24.11GHz

Frequency	Reading	Direction	Height	Test Distance	Antenna factor	Cable Loss	Correction	Extrapolate level	15.245	15.245	Detector
MHz	dBuv	Degree	Meter	meter	dB/m	dB	dBuv/m	dBuv/m	Limit (dBuV/m)	Margin	
24110.0000	85.68	0	1.1	1	35.02	10.5	131.20	121.63	128	-6.33	Fund/Peak
48220.0000	55.83	0	1.1	0.4	41.09	/	96.92	79.42	88	-8.54	Peak
48220.0000	51.33	0	1.1	0.4	41.09	/	92.42	74.92	88	-13.04	Peak
72330.0000	55.17	0	1.1	0.2	42.40	/	97.57	74.05	88	-13.91	Peak
24110.0000	74.17	0	1.1	1	34.83	10.5	119.50	109.96	128	-18.00	Fund/Peak
72330.0000	47.67	0	1.1	0.2	42.40	/	90.07	66.55	88	-21.41	Peak

TX, 1GHz -120GHz , High channel. : 24.17GHz

Frequency	Reading	Direction	Height	Test Distance	Antenna factor	Cable Loss	Correction	Extrapolate level	15.245	15.245	Detector
MHz	dBuv	Degree	Meter	meter	dB/m	dB	dBuv/m	dBuv/m	Limit (dBuV/m)	Margin	
48.3400	53.85	0	1.1	0.4	41.09	/	94.94	77.44	88	-10.52	Peak
48.3400	49.53	0	1.1	0.4	41.09	/	90.62	73.12	88	-14.84	Peak
24.1700	84.21	0	1.1	1	35.02	10.5	129.73	112.23	128	-15.73	Fund/Peak
72.5100	52.26	0	1.1	0.2	42.40	/	94.66	71.14	88	-16.82	Peak
24.1700	73.12	0	1.1	1	34.83	10.5	118.45	109.96	128	-18.00	Fund/Peak
72.5100	44.5	0	1.1	0.2	42.40	/	86.90	63.38	88	-24.58	Peak

RX, 30 - 1000MHz, Low Channel

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifer	Correction Factor	FCC B	FCC B
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin (dB)
283.05	43.4	145	1.8	v	13.5	3.5	27.4	33	46	-13.0
272.51	41.7	245	2.6	h	13.2	3.4	27.4	30.9	46	-15.1
147.21	41.7	200	2.3	v	12.7	2.5	28	28.9	46	-17.1
283.05	38.6	160	1.8	h	13.5	3.5	27.4	28.2	46	-17.8
215.78	41.8	340	2.5	v	10.6	3.1	27.6	27.9	46	-18.1
272.51	38.3	100	1.6	v	13.2	3.4	27.4	27.5	46	-18.5
215.78	37.5	175	1.7	h	10.6	3.1	27.6	23.6	46	-22.4
147.21	33.2	15	1.5	h	12.7	2.5	28	20.4	46	-25.6

RX, 30 - 1000MHz, High Channel

Frequency	Reading	Direction	Height	Polar	Antenna Factor	Cable loss	Amplifer	Correction Factor	FCC B	FCC B
MHz	dBuV	Degree	Meter	H / V	dB/m	dB	dB	dBuV/m	Limit (dBuV/m)	Margin (dB)
171.64	44.3	255	1.7	v	11.9	2.8	27.8	31.2	46	-14.8
275.02	40.1	75	1.6	v	13.4	3.5	27.4	29.6	46	-16.4
275.02	39.86	205	1.4	h	13.4	3.5	27.4	29.36	46	-16.6
240.03	41.3	95	1.2	v	11.5	3.3	27.5	28.6	46	-17.4
145.23	40.7	135	1.9	h	12.7	2.5	28	27.9	46	-18.1
145.23	38.9	255	1.8	v	12.7	2.5	28	26.1	46	-19.9
240.03	38.3	180	1.6	h	11.5	3.3	27.5	25.6	46	-20.4
171.64	38.74	210	1.8	h	11.9	2.8	27.8	25.64	46	-20.4