



FCC PART 15.249


## EMI MEASUREMENT AND TEST REPORT

For

Apple Computer Inc.

1 Infinite Loop Mail Stop 26A  
Cupertino, CA, 95014

**FCC ID: BCGA1191**  
**Model: A1191**

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report	<b>Product Type:</b> Low Power Transmitter
<b>Test Engineer:</b> <u>Snell Leong</u>	<i>Snell.</i>
<b>Report No.:</b> <u>R0604184a</u>	
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## GENERAL INFORMATION

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### Product Description for Equipment Under Test (EUT)

The A45 is a wireless interface product for the Apple iPod Nano. The A45 unit has no operator controls or indicators.

The A45 is powered from the Apple iPod Nano via the 30 pin iPod interface connector on the iPod. The primary function of the device initially is to be a receiver but the device may be used as a transmitter for a future application. The A45 contains the interface circuits and a 2.400 GHz band transceiver chip. The A45 is internally set to operate on 2.425 GHz.

### Mechanical Description

The *Apple Computer Inc.* product, *FCC ID: BCGA1191*, or the “EUT” as referred to this report is a Single Frequency Low Power Transmitter, which measures approximately 26.1mm L x 21.5mm W x 5.9mm H.

*\*The test data gathered are from typical production sample, serial number: B2XXA6101D1 provided by the manufacturer.*

### EUT Photos



Additional photos in Exhibit B

### Objective

This type approval report is prepared on behalf of *Apple Computer Inc.* in accordance with ANSI C63.4 - 2003.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209, and 15.249.

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

No Related Submittals

## **Test Methodology**

All measurements contained in this report were conducted in accordance 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 Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emissions measurement data is located at it's facility in Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation 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 have the reports on file and are listed under FCC registration number: 90464 and VCCI Registration No.: C-1298 and R-1234.

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

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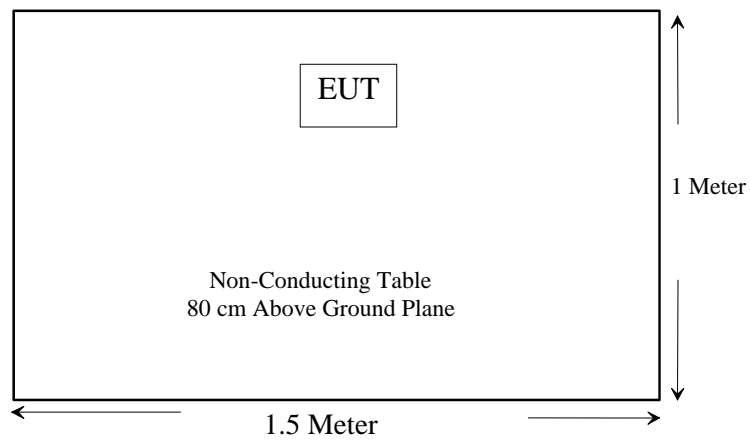
### Justification

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

### Equipment Modifications

No modifications were made to the EUT.

### Test Setup Block Diagram



## SUMMARY OF TEST RESULTS

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FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirements	Compliant
§15.207(a)	Conducted Emissions	N/A*
§15.205, §15.209 (a), §15.249 (a)	Radiated Emissions	Compliant
15.249 (c)	Band Edge Testing	Compliant

*\*This is a battery operated device. AC line conducted emissions testing do not apply.*





## **§15.203 - ANTENNA REQUIREMENT**

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### **Applicable Standard:**

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

### **Antenna Construction:**

The antenna is permanently attachment to the device.

## **§ 15.207 (a) - CONDUCTED EMISSIONS TEST DATA**

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This is a battery operated device. AC line conducted emissions testing do not apply.

## **§15.205, §15.209 (a), §15.249 (a) - RADIATED EMISSIONS DATA**

### **Applicable Standard:**

According to §15.249 (a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency	Field strength of Fundamental frequency (mV/m)	Field strength of Fundamental harmonics (mV/m)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

According to §15.249 (d), emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emissions limits in §15.209, whichever is the lesser attenuation.

### **Measurement Uncertainty:**

All measurements involve certain levels of uncertainties, especially in field of EMC. 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  $\pm 4.0$  dB.

### **EUT Setup:**

The radiated emissions testing and setup were performed in a semi-anechoic shield room, in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

### **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Cal. Date
Sonoma Instruments	Pre amplifier	317	260406	2006-02-03
Sunol Sciences	Combination Antenna	JB3 Antenna	A013105	2006-02-11
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	100044	2006-02-07
Agilent	Pre amplifier	8449B	3008A01978	2005-08-10
A.R.A	Horn Antenna	DRG-118	1132	2005-08-17

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

### Environmental Conditions:

Temperature:	20 °C
Relative Humidity:	43%
ATM Pressure:	1078mbar

*\*Testing was performed by Snell Leong on 2005-05-05.*

### Test Procedure:

The maximizing procedure was performed on the six (6) highest emissions to ensure the EUT's compliance with all installation combinations.

All the data were recorded in the peak detection mode. Quasi-peak readings were performed only when an emissions were 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:

$$\text{Corrected Reading} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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 emissions are 7dB below the maximum limit for applicable limits. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Reading} - \text{Applicable Limit}$$

### Summary of Test Results:

According to the recorded data in following table, the EUT measured test data within the measurement uncertainty of  $\pm 4.0$ , and had the worst margin of:

**-12.1 dB at 7275.00 MHz in the Vertical polarization**

### Radiated Emissions Test Result Data:

Frequency MHz	Reading dBuV/m	Azimuth Degrees	Height m	Antenna Polarization H / V	Antenna Factor dB	Cable loss dB	Amplifier Gain dB	Corrected Reading dBuV/m	15.249 Limit (dBuV/m)	15.249 Margin	Comments
7275.0000	28.9	180	2.0	V	37.6	12.3	36.9	41.9	54	-12.1	Ave
7275.0000	28.4	90	2.0	H	37.6	12.3	36.9	41.4	54	-12.6	Ave
4850.0000	37.6	270	2.4	V	32.1	6.0	34.4	41.3	54	-12.7	Ave
4850.0000	37.1	180	2.3	H	32.1	6.0	34.4	40.8	54	-13.2	Ave
7275.0000	43.2	90	2.0	V	37.6	12.3	36.9	56.2	74	-17.8	Peak
7275.0000	42.5	180	2.0	H	37.6	12.3	36.9	55.5	74	-18.5	Peak
4850.0000	51.7	270	2.4	V	32.1	6.0	34.4	55.4	74	-18.6	Peak
4850.0000	51.4	180	2.3	H	32.1	6.0	34.4	55.1	74	-18.9	Peak
2425.0000	90.3	0	1.2	H	28.2	4.4	36.2	86.7	114	-27.3	Fund/Peak
2425.0000	68.9	0	1.2	H	28.2	4.4	36.2	65.3	94	-28.7	Ave
2425.0000	88.3	90	1.0	V	28.2	4.4	36.2	84.7	114	-29.3	Fund/Peak
2425.0000	67.5	180	1.2	V	28.2	4.4	36.2	63.9	94	-30.1	Ave

## §15.249(c) – BAND-EDGE TESTING

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### Applicable Standard:

Requirements: FCC 15.249 (c), the emissions power at the START and STOP frequencies shall be at least 50 dB below the level of the fundamental or to the general radiated emissions limits in FCC 15.209, whichever is the lesser attenuation.

### Test Procedure:

With the EUT's antenna attached, the EUT's radiated emissions power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.

### Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2006-03-06

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

### Environmental Conditions:

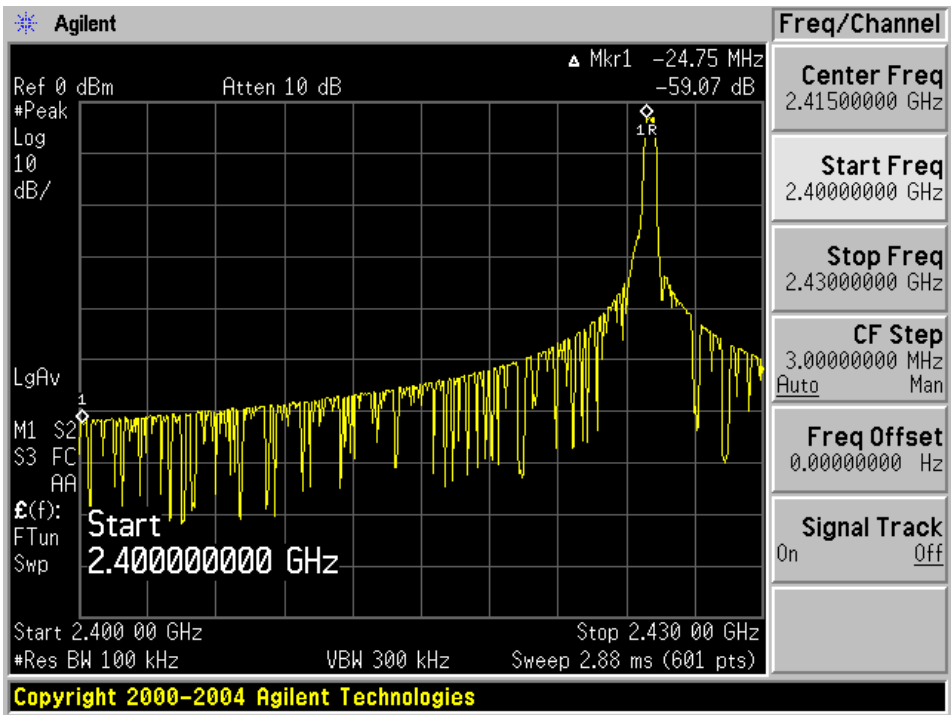
Temperature:	20 °C
Relative Humidity:	43%
ATM Pressure:	1078mbar

*\*Testing was performed by Snell Leong on 2005-05-05.*

### Test Results:

Refer to the attached plots.

Low Channel



High Channel

