



**CERTIFICATION REPORT  
OF A  
INTENTIONAL RADIATOR**

Per

**Part 15 Subpart C  
CFR 47, Section 15.231 paragraph (a)**

**EUT: AirClick**

PREPARED FOR APPLICANT:

**Griffin Technology**

1619 Elm Hill Pike  
Nashville, TN 37210



NVLAP Lab Code 200634-0

REPORT # 56050AF

TEST COMPLETION DATE: January 13, 2005



Prepared By:  
DNB ENGINEERING, INC.  
1100 East Chalk Creek Rd.  
Coalville, Utah 84017  
Tel: 1(435) 336-4433

## EXECUTIVE SUMMARY

The purpose of this series of tests was to demonstrate the Electromagnetic Compatibility (EMC) characteristics of the AirClick, the following tests were performed:

REQUIREMENTS	STATUS	COMPLIANT Yes/No/NA
47 CFR Part 15, Subpart C	Section 15.231	Yes



Signed By: \_\_\_\_\_

Clay Allred  
Lab Manager  
DNB Engineering Inc.

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### DOCUMENT HISTORY

Revision Letter	Number of Pages	Page No. of Rev.	Description	Date
	19		Document Release	3/1/05

## TABLE OF CONTENTS

1.	INTRODUCTION.....	7
1.1	ADMINISTRATIVE DATA .....	7
1.1.1	REQUEST FOR CERTIFICATION .....	7
1.2	TEST CONFIGURATION.....	7
1.3	EQUIPMENT DESCRIPTION .....	7
1.4	MODE OF OPERATION .....	7
1.5	DOCUMENTED EMC CONTROL MEASURES .....	7
1.6	CLOCKS AND OSCILLATORS:.....	7
1.7	TEST PLAN SUMMARY .....	8
1.8	JUSTIFICATIONS.....	8
2.	RADIATED EMISSIONS FCC CFR 47 PART 15 SUBPART C .....	9
2.1	RADIATED EMISSIONS.....	9
2.1.1	Test Setup and Procedure .....	9
2.2	RADIATED EMISSIONS COMPLIANCE DATA .....	11
2.3	DUTY CYCLE CALCULATIONS.....	12
2.4	CLIMATIC CONDITIONS .....	12
2.5	COMPLIANT STATEMENT .....	12
3.	OCCUPIED BANDWIDTH – PER ANSI C63.4 ANNEX I.6.....	13
3.1	TEST SETUP AND PROCEDURE .....	13
3.2	OCCUPIED BANDWIDTH TEST DATA.....	13
3.3	OCCUPIED BANDWIDTH.....	14
4.	APPENDIX SECTION.....	15
4.1	APPENDIX A: UNCERTAINTY TOLERANCE.....	15
4.2	APPENDIX B: SITE CHARACTERISTICS, .....	15
4.2.1	Ambient Emissions.....	15
4.2.2	FCC Certification.....	16
4.2.3	NVLAP Accreditation .....	17
4.2.4	NVLAP Accreditation .....	18
4.3	APPENDIX C: EMC INSTRUMENTATION AND MEASUREMENT EQUIPMENT.....	19

## TRANSMITTAL SUMMARY

<u>Unit tested:</u>	AirClick
<u>Specifications:</u>	47 CFR Part 15 Subpart C section 15.231(a) / ANSI C63.4
<u>Purpose of Report:</u>	This report was prepared to document the status of the <b>AirClick</b> with requirements of the standards listed above
<u>Test Summary:</u>	The EUT's compliance status according to the tests performed is as follows:  Refer to Page 2 Executive Summary.

**CERTIFICATION OF TEST DATA**

This report, containing electromagnetic immunity and emissions test data and evaluations, has been prepared by an independent electromagnetic compatibility laboratory, DNB ENGINEERING, in accordance with the applicable specifications and instructions required per the Introduction. NEMKO and the National Institute of Standards and Technology have evaluated DNB Engineering to do these tests for NVLAP.

**NEMKO EMC Laboratory Authorization No.: ELA 116**

**NVLAP Lab Code: 200634-0**

The data evaluation and equipment configuration presented herein are a true and accurate representation of the measurements of the test sample's electromagnetic immunity and emissions characteristics as of the dates and at the times of the test under the conditions herein specified.

Equipment Tested: AirClick

Test Completion Date: 1/13/05

Report Written By:

  
\_\_\_\_\_

Clay Allred  
Lab Manager

3/1/2005

Date

Report Reviewed By:

  
\_\_\_\_\_

Carrie Yates  
Quality Assurance Manager

3/1/2005

Date

## 1. INTRODUCTION

### 1.1 Administrative Data

#### 1.1.1 REQUEST FOR CERTIFICATION

Applicant: **Griffin Technology**  
 1619 Elm Hill Pike Suite 400  
 Nashville, TN 37210

Contact: Stephen Woolverton  
 Phone Number: 615-399-7000  
 Fax Number: 615-399-7000  
 Email: Stephen@griffintechnology.com  
 Test Completion Date: January 13, 2005

Equipment Under Test (EUT): **AirClick**  
**FCC ID PAV4021AC**

### 1.2 Test Configuration

Config-uration	Unit Name - Processor, Monitor, Printer, Cable, etc. (indent for features of a unit)	Style/Model/Part No.	Serial Number	Obj. of test	VAC	Comments/ FCC ID#
1	Transmitter	<b>AirClick</b>	P214	X	Battery operated	<b>PAV4021AC</b>

X - Specific device(s) for which this test is being conducted.

### 1.3 Equipment Description

The Griffin AirClick is intended to control the operation of the Apple iPod fitted with the appropriate Receive device.

### 1.4 Mode of operation

The EUT had a new battery installed and was setup in a transmit state. The volume bottom was tapped down in order for the transmitter to remain in a Transmit state during testing. Prior to testing the Fundamental Frequency of the Device under test was monitored while being set up in different orientations, in order to find the position of maximum emissions.

### 1.5 Documented EMC Control Measures

None

### 1.6 Clocks and Oscillators:

13.56 MHz Crystal & 433.92 MHz Transmit Frequency

## **1.7 Test Plan Summary**

Refer to the Executive Summary on Page 2

## **1.8 Justifications**

None



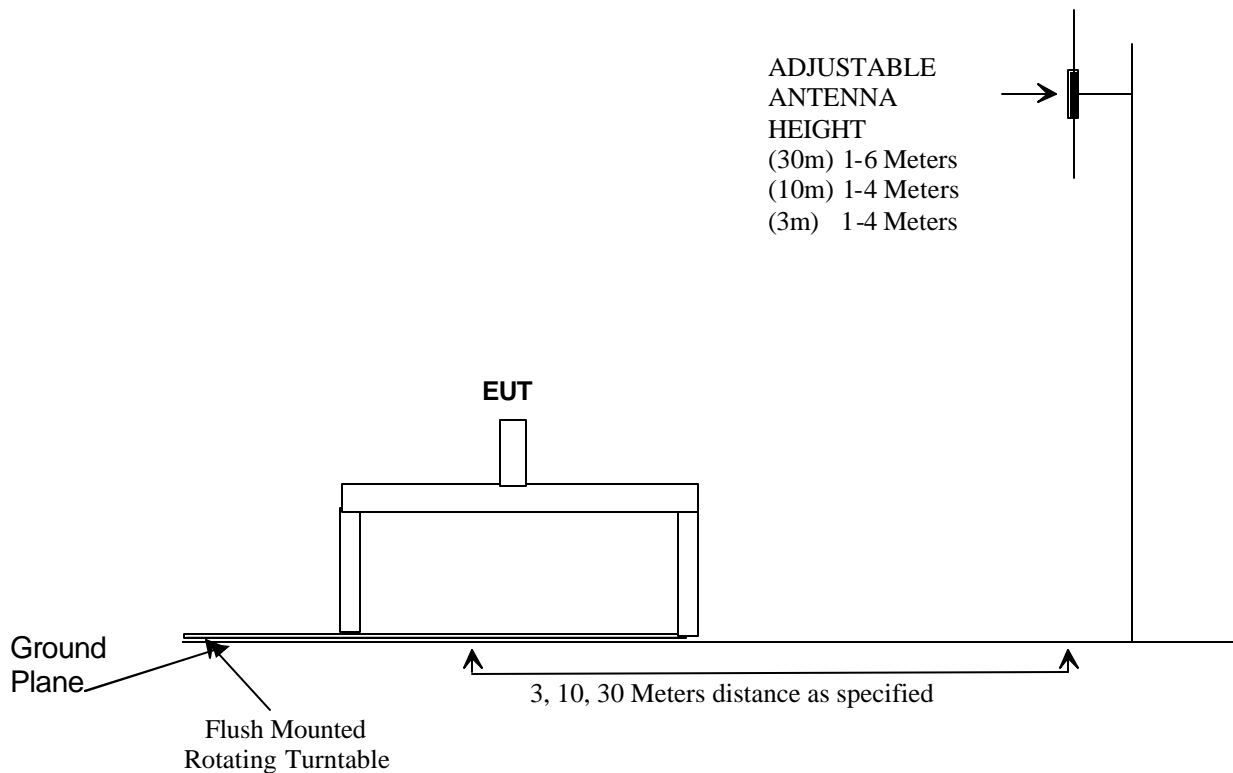
## 2. RADIATED EMISSIONS FCC CFR 47 PART 15 SUBPART C

### 2.1 Radiated Emissions

#### 2.1.1 Test Setup and Procedure

The EUT was placed on a wooden table 1 meter wide and 1.5 meters long which rests on a flush mounted, steel-top turntable on the open area test site as shown below. The top of the table is 80 cm above the ground plane. The turntable can be rotated 360 degrees. Measuring antenna is set at the prescribed distance. Measurements are made with broadband antennas that have been correlated with tuned dipole antennas. The mast is 4.5 meters high and is self-supporting. The height of the antenna can be varied from 1 to 4 meters. Positioning of the antenna is controlled remotely.

### Open Area Test Site



**Radiated Test Setup and Procedure - contd.**

The EUT is put into the operational test mode as stated in Section 1.4, it is then started.

The spectrum analyzer is setup to store the peak emission over the frequency range of the antenna. Peak EUT and ambient emissions are stored while the turntable is rotated 360°. The Peak spectrum analyzer trace is then plotted with the addition of antenna and cable correction factors. The limit is plotted on the same graph. A receiver with CISPR Quasi Peak detector is then used on the frequencies identified as the highest with respect to the plotted limit. Ambients are noted on the graph along with EUT emissions. The highest emissions are maximized.

To maximize emissions levels, the turntable is rotated and the antenna is raised and lowered to determine the point of maximum emanations. The cables are then manipulated at that point to maximize emissions. Measurements are made with the antennas in each horizontal and vertical polarization. The data obtained from these tests is corrected with the proper cable, preamplifier and antenna factors. The results are then transcribed onto tables that show the maximum emission levels. The highest emissions are listed in a Radiated Emissions Summary table.

If no emissions can be found, the lowest harmonics of the EUT clocks within the bands of the standard are tuned into with the receiver. If no emissions are found, the noise floor will be entered to the table and noted. A minimum of six frequencies will be logged. Summary results will reflect only actual emissions from the EUT.

The field intensity measurements are made using standard techniques with a spectrum analyzer or EMI receiver as the calibrated Field Intensity Meter (FIM). Preamplifiers and filters are used when required.

When using the Hewlett Packard 8566B Spectrum Analyzer as the FIM, the Analyzer is calibrated to read signal level in dBm. Where:

$$0 \text{ dBm (50 ohms)} = 107 \text{ dB}\mu\text{V (50 ohms)}$$

The signal level (dBμV) = indicated signal level (dBm) + 107 dB. To obtain the signal level in dBuV/m it is necessary to add the antenna factor in dB.

**Example of Typical Calculation**

Measurement Distance = 3 Meter	
Rohde and Schwarz reading @ 60 MHz	49.0 dBμV
Antenna Factor	+7.5 dB
Cable Loss	+2.0 dB
Preamplifier	-25.5 dB
Total Factors	<u>-16.0 dB/m</u>
Field Strength dBμV/m at 3 Meter =	<u>33.0 dBμV/m</u>

## 2.2 Radiated Emissions Compliance Data

The EUT was compliant with CFR 47 Part 15 Subpart C 15.231 (a)

### Fundamental Frequency Measurements and Spurious Emission Measurements Per CFR 47 part 15 at 3 meters

#### Fundamental Frequency Test Data

Griffin Technology							EUT: AirClick						
Freq (MHz)	Meas'd (dBuV)	Amp Factors (dB)	Cable Factors (dB)	Antenna Factors (dB)	Total Factors (dBuV/m)	Total (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Azimuth (degree)	Height (m)	Polarity Hor Vert	Meas. Type Ave, QP, PK	
434.01	67.60	26.50	4.50	18.10	-3.90	63.70	80.80	-17.10	88	1.00	Vert	QP	
434.01	64.50	26.50	4.50	18.30	-3.70	60.80	80.80	-20.00	21	3.79	Hor/	QP	

#### Spurious Radiated Emissions Test Data

Griffin Technology							EUT: AirClick						
Freq (MHz)	Meas'd (dBuV)	Amp Factors (dB)	Cable Factors (dB)	Antenna Factors (dB)	Total Factors (dBuV/m)	Total (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Azimuth (degree)	Height (m)	Polarity Hor Vert	Meas. Type Ave, QP, PK	
867.99	51.40	27.00	6.50	25.20	4.70	56.10	60.80	-4.70	170	1.96	Hor/	QP	
867.99	48.20	27.00	6.50	24.20	3.70	51.90	60.80	-8.90	205	1.00	Vert	QP	

#### Spurious Radiated Emissions Above 1 GHz Test Data

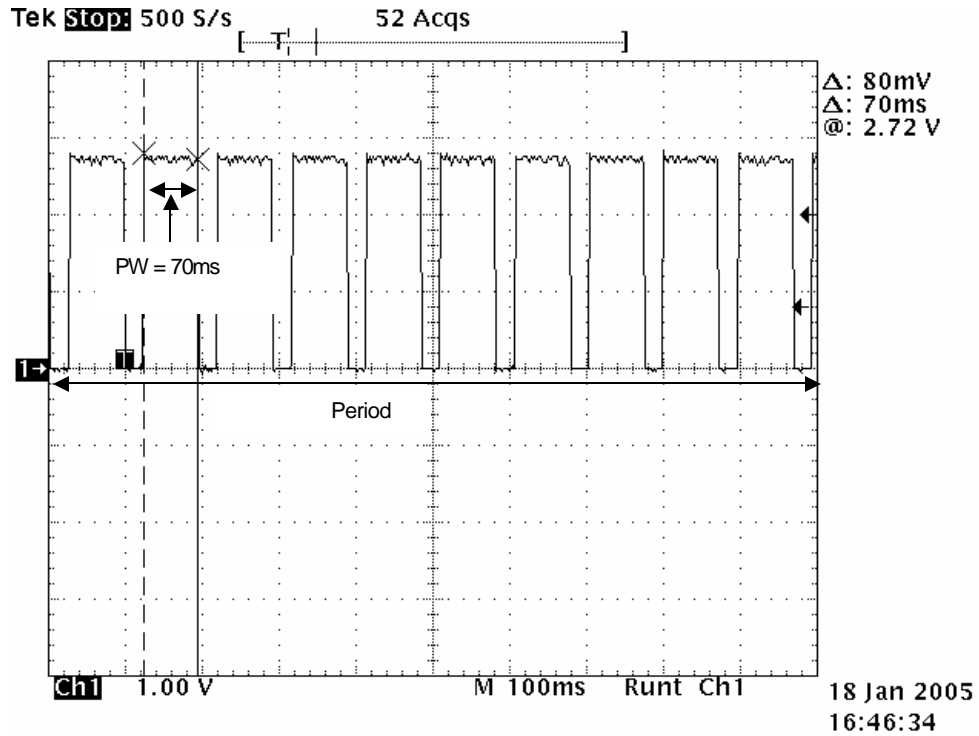
Griffin Technology							EUT: AirClick							
Freq (MHz)	Meas'd (dBuV)	Duty Cycle (%)	Corrected Meas'd (dBuV)	Amp Factors (dB)	Cable Factors (dB)	Antenna Factors (dB)	Total Factors (dBuV/m)	Total (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Azimuth (degree)	Height (m)	Polarity Hor Vert	Meas. Type Ave, PK
1301.88	67.60	70%	47.32	24.22	2.68	25.39	3.85	51.17	60.80	-9.63	14	1	Vert	Peak
1735.94	60.10	70%	42.07	26.26	3.13	27.66	4.53	46.60	60.80	-14.20	192	1	Vert	Peak
1301.83	59.25	70%	41.48	24.22	2.68	25.49	3.95	45.42	60.80	-15.38	78	2.34	Hor	Peak
1735.82	52.85	70%	37.00	26.26	3.13	27.71	4.58	41.57	60.80	-19.23	76	1.52	Hor	Peak
2169.84	41.20	70%	28.84	26.51	3.61	29.74	6.85	35.69	60.80	-25.11	255	1	Vert	Peak

- Highest frequencies relative to the Limit.

### 2.3 Duty Cycle Calculations

Duty Cycle = PW X (Number of Pulses) / Period

Duty Cycle = 70 ms \* 10 (700 ms) / 1000 ms. = 70%



### 2.4 Climatic Conditions

The climatic conditions during the Radiated Emissions tests were recorded as follows:

Ambient Temperature	Measured Value 13 C	Acceptable 15 to 35° C
Relative Humidity	40%	25 to 75%

### 2.5 Compliant Statement

The EUT was compliant with **Part 15 Subpart C**

YES	NO
CA	

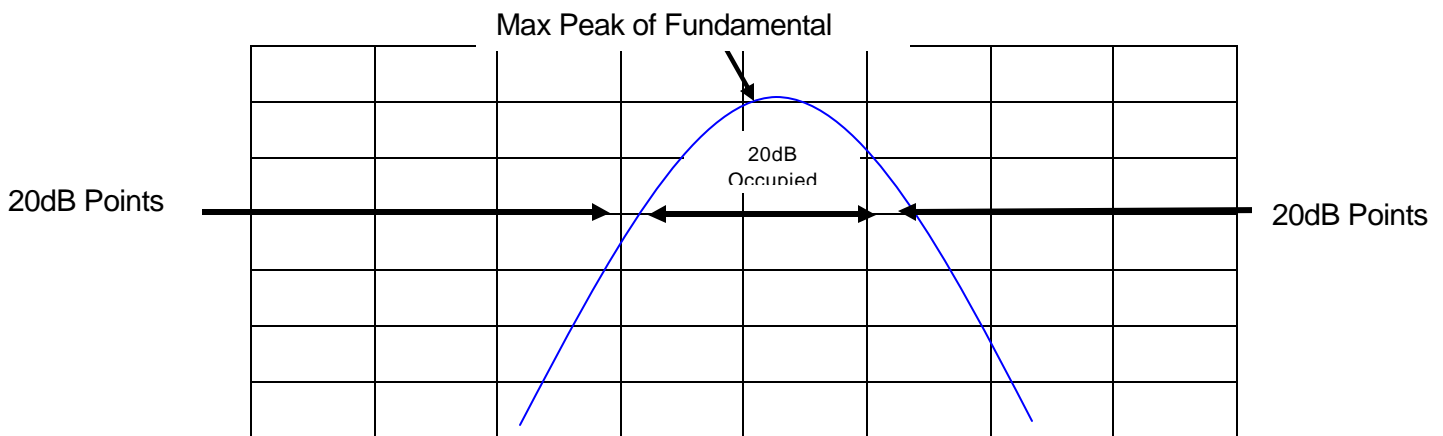
CA Test Engineer's Initials

### 3. OCCUPIED BANDWIDTH – PER ANSI C63.4 ANNEX I.6

#### 3.1 Test Setup and Procedure

The Test Site and EUT were set up as described in section 2.1 of this document. The EUT is put into the operational test mode as stated in Section 1.4 and then started. The spectrum analyzer had its self-calibration performed, and then set to the frequency to be tested, with a bandwidth of 10kHz as per ANSI C63.4 Annex I.6 paragraph b. The Max Peak of the Fundamental Frequency was noted, and the points 20 dB below the Fundamental Max Peak, for both sides of the signal was noted, and the frequency difference between these points was recorded as the occupied bandwidth. See below for example.

#### Example Of Occupied Bandwidth Measurement



Instrumentation Bandwidth set as described in ANSI C63.4 Annex I.6

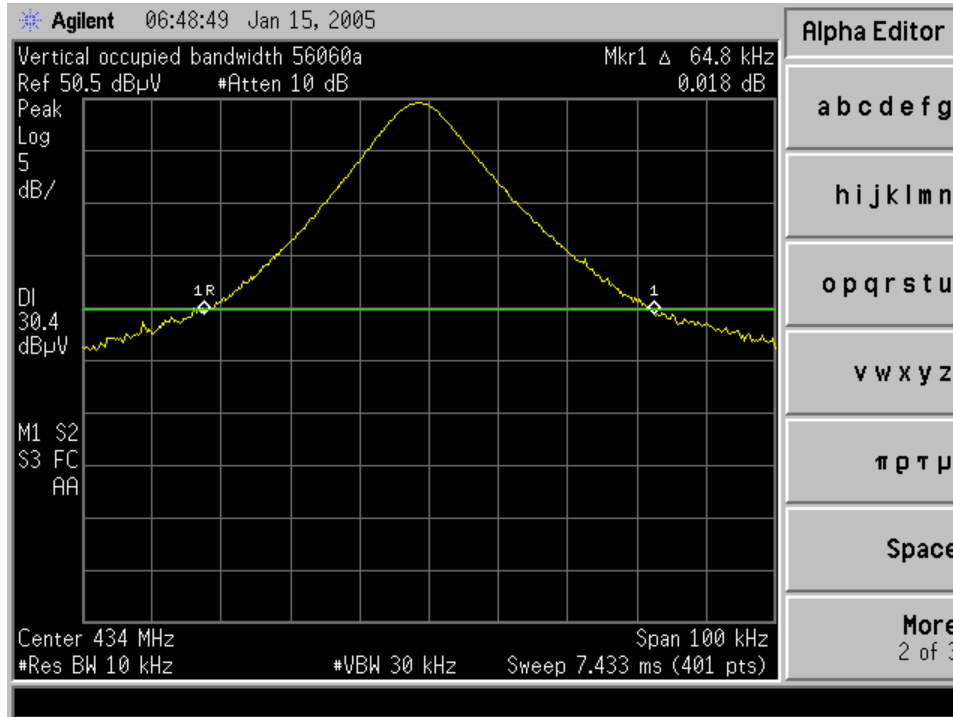
#### 3.2 Occupied Bandwidth Test Data.

Frequency (MHz)	Measured Bandwidth	Bellow Fundamental	Polarity	Instrument Bandwidth	Required Occupied Bandwidth	Result	Comments
433.9	68.4 kHz	20dB	Vertical	10kHz	1.085 MHz	Pass	
433.9	62.7 kHz	20dB	Horizontal	10kHz	1.085 MHz	Pass	

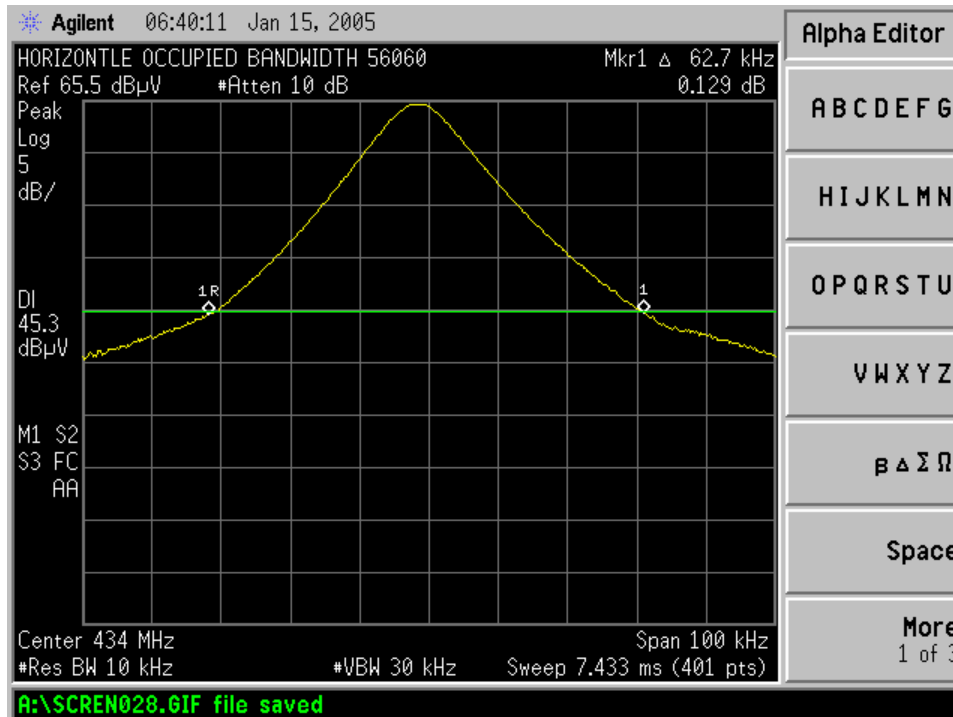
Refer to section 3.3 for Test Data

### 3.3 Occupied Bandwidth

Vertical



Horizontal



## 4. APPENDIX SECTION

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### 4.1 APPENDIX A: UNCERTAINTY TOLERANCE

DNB Engineering's Utah Facility is within acceptable uncertainty tolerances per ANSI C63.4 sections 5.4.6.1 and 5.4.6.2 as well as CISPR 16-1 Annex M, section M.2.

#### ANSI C63.4

5.4.6.1 Site Attenuation. A measurement site shall be considered acceptable for radiated electromagnetic field measurements if the horizontal and vertical NSA derived from measurements, i.e., the "measured NSA," are within  $\pm 4$  dB of the theoretical NSA (5.4.6.3) for an ideal site.

5.4.6.1 NSA Tolerance. The  $\pm 4$  dB tolerance in 5.4.6.1 includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies. These errors are analyzed in ANSI C63.6-[3], wherein it is shown that the performance of a well-built site contributes only 1 dB of the total allowable tolerance.

#### CISPR 16-1

M.2 Error analysis

... The total estimated errors are the basis for the  $\pm 4$  dB site acceptability criterion consisting of approximately 3 dB measurement uncertainties and an additional allowable 1 dB for site imperfections.

### 4.2 APPENDIX B: SITE CHARACTERISTICS,

#### CHALK CREEK EMI TEST SITE

The DNB Engineering test facility is located in Chalk Creek Canyon near Coalville, Utah. Site characteristics were measured according to the procedures outlined in ANSI C63.4 "Characteristics of Open Field Test Site". The results of these characterizations indicate that the Chalk Creek site is an outstanding facility to perform accurate and repeatable EMI tests.

#### 4.2.1 Ambient Emissions

Ambient Emission measurements were made to determine the level of the ambient emanations at the DNB test facility. The results indicate that all ambient signals are below the FCC Radiated Emission limits or that each can easily be identified as an ambient signal.

## 4.2.2 FCC Certification

### FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division  
7435 Oakland Mills Road  
Columbia, MD 21046

May 14, 2002

Registration Number: 90532

DNB Engineering, Inc.  
1100 E. Chalk Creek Rd.  
Coalville, UT 84017

Attention: Bryan Broaddus

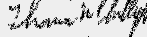
Re: Measurement facility located at Chalk Creek  
3, 10 & 30 meter sites  
Date of Listing: May 14, 2002

Gentlemen:

Your request for registration of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC rules. The information has, therefore, been placed on file and the name of your organization added to the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website [www.fcc.gov](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

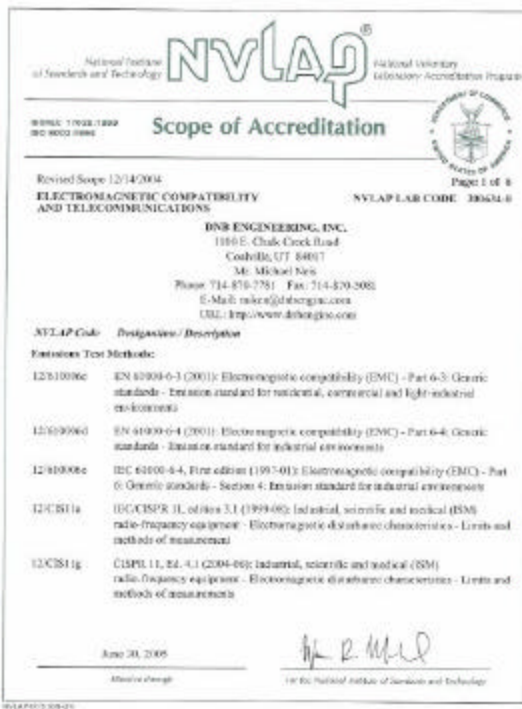
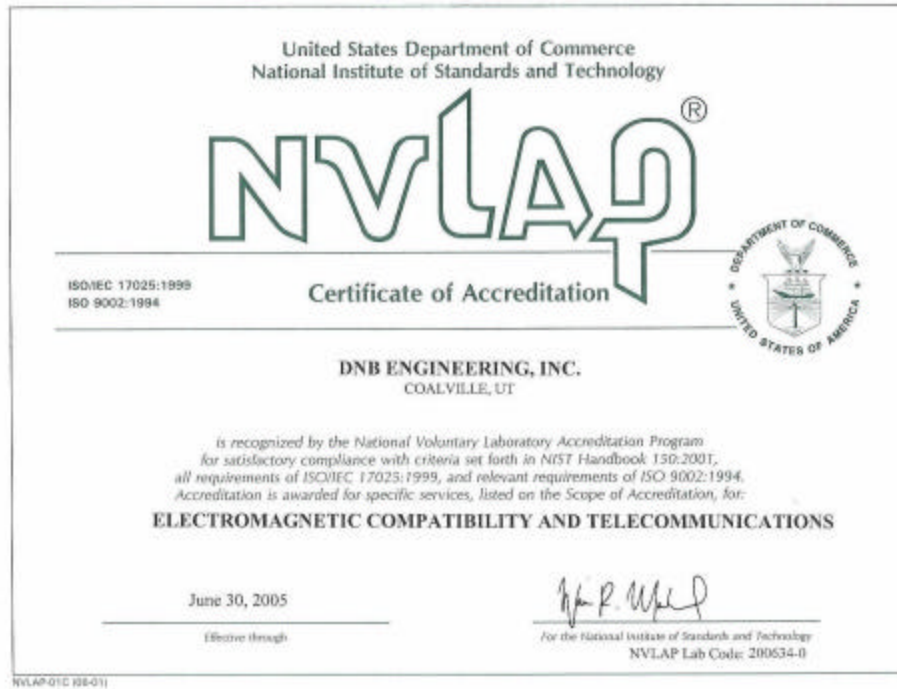
Sincerely,



Thomas W Phillips  
Electronics Engineer



4.2.3 NVLAP Accreditation



4.2.4 NVLAP Accreditation

National Institute of Standards and Technology **NVLAP** National Voluntary Laboratory Accreditation Program

1010C 17020-1000  
1010C 1002-1004

**Scope of Accreditation**

Page: 3 of 8

Revised Scope 12/14/2004  
**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**  
 NVLAP LAB CODE 200634-0  
**DNB ENGINEERING, INC.**

*NVLAP Code Designation / Description*

- 12CIS22a IEC CISPR 22 (1997), EN55022 (1998) + A1(2000) & A2(2001): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
- 12CIS22b CNS 1308 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
- 12CIS22c IEC CISPR 22, Fourth Edition (2003-04) and EN 55022 (1998): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
- 12EM02a IEC 61000-3-2, Edition 1.1 (2001-10), EN 61000-3-2 (2000), and AS/NZS 2279.1 (2000): Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A)
- 12EM03b IEC 61000-3-3, Edition 1.1 (2002-05) & EN 61000-3-3, A1(2001): EMC - Part 3-3: Limits - Limitations of voltage changes, voltage fluctuations and flicker, in public low-voltage supply-systems, for equipment with rated current <=16 A per phase and not subject to conditional connection
- 12RC15b ANSI C63.4 (2001) with FCC Method - 47 CFR Part 15, Subpart B: Unintentional Radiators

June 30, 2005  
Effective through

*[Signature]*  
For the National Institute of Standards and Technology

NVLAP0100001

National Institute of Standards and Technology **NVLAP** National Voluntary Laboratory Accreditation Program

1010C 17020-1000  
1010C 1002-1004

**Scope of Accreditation**

Page: 4 of 8

Revised Scope 12/14/2004  
**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**  
 NVLAP LAB CODE 200634-0  
**DNB ENGINEERING, INC.**

*NVLAP Code Designation / Description*

- 12T31 AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997): Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment

**Immunity Test Methods:**

- 12CIS14a IEC CISPR 14-2, Edition 1.1 (2001-11): Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard
- 12CIS20b IEC CISPR 20, 5th Ed. (2002-02): Sound and television broadcast receivers and associated equipment - Immunity characteristics - Limits and methods of measurement
- 12CIS24d IEC CISPR 24 (1997) & EN 55024 (1998) + A1 (2001), A2 (2002): Information technology equipment - Immunity characteristics - Limits and methods of measurement
- 12R01 IEC 61000-4-2, Edition 2.1 (2001) including Ambs. 1 & 2 and EN 61000-4-2: Electrostatic Discharge Immunity Test
- 12R02 IEC 61000-4-3, Edition 2.0 (2002-07) and EN 61000-4-3: Radiated Radio-Frequency Electromagnetic Field Immunity Test
- 12R02a IEC 61000-4-3, Ed. 2.1 (2002-09), EN 61000-4-3 (2002): Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test

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**Scope of Accreditation**

Page: 5 of 8

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**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**  
 NVLAP LAB CODE 200634-0  
**DNB ENGINEERING, INC.**

*NVLAP Code Designation / Description*

- 12R03 IEC 61000-4-4 (1995) + Amd. 1 (2000) & Amd. 2 (2001) and EN 61000-4-4: Electrical Fast Transients/Burst Immunity Test
- 12R03a IEC 61000-4-4, Ed. 2.0 (2004-07): Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
- 12R04 IEC 61000-4-5, Edition 1.1 (2001-04) and EN 61000-4-5: Surge Immunity Test
- 12R05 IEC 61000-4-6, Edition 2.0 (2003-05) and EN 61000-4-6: Immunity to Conducted Disturbance, Induced by Radio-Frequency Fields
- 12R06 IEC 61000-4-8, Edition 1.1 (2001) and EN 61000-4-8: Power Frequency Magnetic Field Immunity Test
- 12R07 IEC 61000-4-11, Edition 1.1 (2001-03) and EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
- 12R07a IEC 61000-4-11, Ed. 2 (2004-03): Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests

**Safety Test Methods:**

- 12V006 IEC 60065 (2000-12), 7th edition: Audio, video and similar electronic apparatus - Safety requirements

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National Institute of Standards and Technology **NVLAP** National Voluntary Laboratory Accreditation Program

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**Scope of Accreditation**

Page: 6 of 8

Revised Scope 12/14/2004  
**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**  
 NVLAP LAB CODE 200634-0  
**DNB ENGINEERING, INC.**

*NVLAP Code Designation / Description*

- 12V01a IEC 601-1 (1988), 2nd edition: Medical electrical equipment - Part 1: General requirements for safety
- 12V060a IEC 60601-1-1 (2000-12), 2nd edition: Medical electrical equipment - Part 1-1: General requirements for safety - Collateral standard: Safety requirements for medical electrical systems
- 12V010a IEC 61010-1 (2001-02), 2nd edition: Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
- 12V1700b IEC 61326, Ed. 2 (2002-02): Electrical equipment for measurement, control and laboratory use - EMC requirements
- 12T41b IEC 60950 (1994-04), 3rd edition: Safety of information technology equipment

**Telecommunications Test Methods:**

- 12GR1009 GR-108-CORE, Issue 3 (October 2002): Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment

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Effective through

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For the National Institute of Standards and Technology

NVLAP0100001

### 4.3 APPENDIX C: EMC INSTRUMENTATION AND MEASUREMENT EQUIPMENT

Calibration of test and measurement equipment is performed by an approved commercial facility, whose standards are traceable to the National Institute of Science and Technology.

#### Radiated Emissions

Description	Manufacturer/MN	Asset #	Serial #	Cal Due
Amplifier	HP/8447D	U-067	2727A06182	23MAR05
Amplifier	HP/8447D	U-065	2727A06180	23MAR05
Amplifier	HP/8447D	U-066	2727A06181	23MAR05
Amplifier	HP/8447D	U-068	2727A06184	23MAR05
Bicon Antenna	SCH/BBA9106	U-187	6	20AUG05
Bicon Antenna	SCH/BBA9106	U-186	7	26JUN05
Log P Antenna	SCH/UJALP9107	U-011	11	26JUN05
Log P Antenna	SCH/UHAL09107	U-010	10	20AUG05
Loop Antenna	R&S/HFH 2-Z2	U-016	880665/-40	22JUL05
QP Adapter	HP/85650 A	U-001	2043A00277	29DEC05
Receiver	R&S/ESVP	U-078	879807/048	14APR05
Receiver	R&S/ESVP	U-083	882402/005	30JAN06
Spectrum Analyzer	Agilent	U-257	MY 42000103	24DEC05
Spectrum Analyzer	HP/8566B	U-138	2421A00516	06MAR05
Amplifier 1-20 GHz	Miteq/AFS6-02002000 18-P-MP	U-162	428738	30MAR05
Horn Antenna, Double Rdg GD	AH Systems/SAS-200/571	U-071	222	17JUN05
Rigid Coax	Pasternack/PE3828-24	U-004	CC-300-5033	26MAR05
High Frequency Cable 1-20 GHz	Andrew/FSJ1-50A	U-323	58051	26MAR05

**End of Report # 56050AF**