Nemko-CCL, Inc.

1940 West Alexander Street
Salt Lake City, UT 84119
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Test Report

Certification

Test Of: LMX9830DONGLE

FCC ID: ED9LMX9838
IC: 1520A-LMX9838

Test Specifications:

47 CFR 15.203 and 47 CFR 15.247(d)
And
RSS-Gen Issue 3 7.1.2, 7.2.2 and RSS-210 Issue 8 A8.5

Test Report Serial No: 249781-4.2

Applicant:
Texas Instruments
2900 Semiconductor Drive
Santa Clara, CA 95052-8090
U.S.A

Date of Test: January 22, 2014

Report Issue Date: February 4, 2014

Accredited Testing Laboratory By:

NVLAP Lab Code 100272-0

CERTIFICATION OF ENGINEERING REPORT

This report has been prepared by Nemko-CCL, Inc. to document compliance of the device described below with the requirements of Federal Communications Commission (FCC) Part 15, Subpart C paragraphs 15.203 and 15.247(d) and Industry Canada RSS-Gen 7.1.2, 7.2.2 and RSS-210 A8.5. This report may be reproduced in full, partial reproduction may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

- Applicant: Texas Instruments
- Manufacturer: Texas Instruments
- Brand Name: Texas Instruments
- Model Number: LMX9830DONGLE
- FCC ID: ED9LMX9838
- IC: 1520A-LMX9838

On this 4th day of February 2014, I, individually and for Nemko-CCL, Inc., certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

Although NVLAP has recognized that the Nemko-CCL, Inc. EMC testing facilities are in good standing, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Nemko-CCL, Inc.

Tested by: Norman P. Hansen
Test Technician

Reviewed by: Thomas C. Jackson
General Manager

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SECTION 1.0 CLIENT INFORMATION

1.1 Applicant:

Company Name: Texas Instruments
2900 Semiconductor Drive
Santa Clara, CA 95052-8090
U.S.A.

Contact Name: Ash Patel
Title: Marketing Engineer

1.2 Manufacturer:

Company Name: Texas Instruments
2900 Semiconductor Drive
Santa Clara, CA 95052-8090
U.S.A.

Contact Name: Ash Patel
Title: Marketing Engineer

SECTION 2.0 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of EUT:

Brand Name:	Texas Instruments
Model Number:	LMX9830DONGLE
Serial Number:	None
Dimensions:	6 cm x 3 cm PCB

2.2 Description of EUT:

The LMX9830DONGLE is a Bluetooth transceiver module that has been previously certified under FCC ID ED9LMX9838 and IC 1520A-LMX9838. The antenna was changed from the antennas the module was using when previously certified. Power was supplied via the USB port of the computer thru a cable with a power jack connector at the LMX9830DONGLE. Communication with the LMX9830DONGLE was established using the serial port with DB9 connector through a USB to serial adapter connected to the USB port of the computer.

2.3 EUT and Support Equipment:

The FCC and IC ID numbers for all the EUT and support equipment used during the test are listed below:

Brand Name Model Number Serial No.	FCC ID/IC ID Number or Compliance	Description	Name of Interface Ports / Interface Cables
BN: Texas Instruments MN: LMX9830DONGLE (Note 1) SN: None	ED9LMX9838 /1520A-LMX9838	Bluetooth transceiver module	See Section 2.4
BN: Samsung MN: N130 SN: LCM93HS900480X	DoC	Netbook Computer	USB/USB cables (Note 2)
BN: Socket MN: 8520-00136 SN: 074800145	DoC	Serial to USB adapter	USB/USB cable Serial/shielded cable with DB9 connectors (Note 2)

Note: (1) EUT
(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.

2.4 Interface Ports on EUT:

Name of Ports	No. of Ports Fitted to EUT	Cable Descriptions/Length
Power	1	USB cable with USB A connector and power jack connector/1.5 meter
Communication	1	Shielded serial cable with DB9 connectors/1.5 meters

2.5 Modification Incorporated/Special Accessories on EUT:

There were no modifications or special accessories required to comply with the specification.

SECTION 3.0 TEST SPECIFICATION, METHODS & PROCEDURES

3.1 Test Specification:

Title:	FCC PART 15, Subpart C (47 CFR 15) 15.203 and 15.247
Title:	RSS-Gen Issue 5 7.1.2 and 7.2.2
Title:	RSS-210 Issue 8 A8.5
Purpose of Test:	The tests were performed to demonstrate compliance with the specifications when using a different antenna than previous certified modules use.

3.2 Methods & Procedures:

3.2.1 §15.203 Antenna Requirement

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

3.2.2 §15.247 Operation within the bands 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition,

radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

3.2.3 RSS-Gen Section 7.1.2 Transmitter Antenna

A transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

3.2.4 RSS-Gen 7.2.2 Emissions Falling Within Restricted Frequency Bands

Restricted bands, identified in Table 1, are designated primarily for safety-of-life services (distress calling and certain aeronautical bands), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following restrictions apply:

(a) Fundamental components of modulation of licence-exempt radio apparatus shall not fall within the restricted bands of Table 1;
(b) Unwanted emissions falling into restricted bands of Table 1 shall comply with the limits specified in RSS-Gen;
(c) Unwanted emissions not falling within restricted frequency bands shall either comply with the limits specified in the applicable RSS, or with those specified in RSS-Gen.

3.2.5 RSS-210 Section A8.5 Out-of-band Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in RSS-Gen is not required.

3.2.6 Test Procedure

The testing was performed according to the procedures in ANSI C63.4: 2003, 47 CFR Part 15, RSS-Gen Issue 3, and RSS-210 Issue 8. Testing was performed at the Nemko-CCL, Inc. Wanship open area test site #2, located at 29145 Old Lincoln Highway, Wanship, UT. This site has been registered with the FCC, and was renewed February 15, 2012 (90504). This registration is valid for three years. This site has also been registered with Industry Canada, and was accepted under Industry Canada Assigned Code 2041A-2 effective until February 14, 2015.

Nemko-CCL, Inc. is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Lab Code: 100272-0, which is effective until September 30, 2014.

SECTION 4.0 OPERATION OF EUT DURING TESTING

4.1 Operating Environment:

Power Supply: 5VDC from the host computer USB port

4.2 Operating Modes:

The transmitter was tested on 3 orthogonal axes while in a constant transmit mode at the upper, middle, and lower channels.

4.3 EUT Exercise Software:

Simply Blue Commander software was used to exercise the transmitter.

SECTION 5.0 SUMMARY OF TEST RESULTS

5.1 Summary of Tests to Support an Antenna Change to the Certified Module:

Section	Environmental Phenomena	Frequency Range (MHz)	Result
15.203 RSS-Gen 7.1.2	Antenna Requirements	Structural requirement	Complied
15.247(d) RSS-Gen 7.2.2 RSS-210 A5.8	Spurious Emissions	0.009 - 24835	Complied

5.2 Result

In the configuration tested, the transceiver complied with the requirements of the specification.

SECTION 6.0 MEASUREMENTS AND RESULTS

6.1 General Comments:

This section contains the test results only. Details of the test methods used and a list of the test equipment used during the measurements can be found in Appendix 1 of this report.

6.2 Test Results:

6.2.1 Antenna Requirements

The EUT uses a chip type antenna that is soldered to the PCB and is not user replaceable.

RESULT

The EUT complied with the specification.

6.2.2 Radiated Spurious Emissions

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental emission was investigated to measure any radiated emission. The following tables show measurements of any emission seen. The tables show the worst-case emission measured from the EUT. For frequencies above 12.5 GHz, a measurement distance of 1 meter was used. The noise floor was a minimum of 6 dB below the limit. The emissions in the restricted bands of 15.205 or Table 3 must meet the limits specified in §15.209 and RSS-Gen Table 5 and Table 6. Plots of the band edges are also shown.

AVERAGE FACTOR

There was no average factor applied.

Transmitting at the Lowest Frequency (2402 MHz)

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Duty Cycle Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4804.0	Peak	Vertical	20.5	37.6	0.0	58.1	74.0	-15.9
4804.0	Average	Vertical	5.7	37.6	0.0	43.3	54.0	-10.7
4804.0	Peak	Horizontal	20.0	37.6	0.0	57.6	74.0	-16.4
4804.0	Average	Horizontal	12.1	37.6	0.0	49.7	54.0	-4.3
7206.0	Peak	Vertical	11.1	41.7	0.0	52.8	74.0	-21.2
7206.0	Average	Vertical	-6.8	41.7	0.0	34.9	54.0	-19.1
7206.0	Peak	Horizontal	18.4	41.7	0.0	60.1	74.0	-13.9

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Duty Cycle Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
7206.0	Average	Horizontal	2.9	41.7	0.0	44.6	54.0	-9.4

Transmitting at the Middle Frequency (2441 MHz)

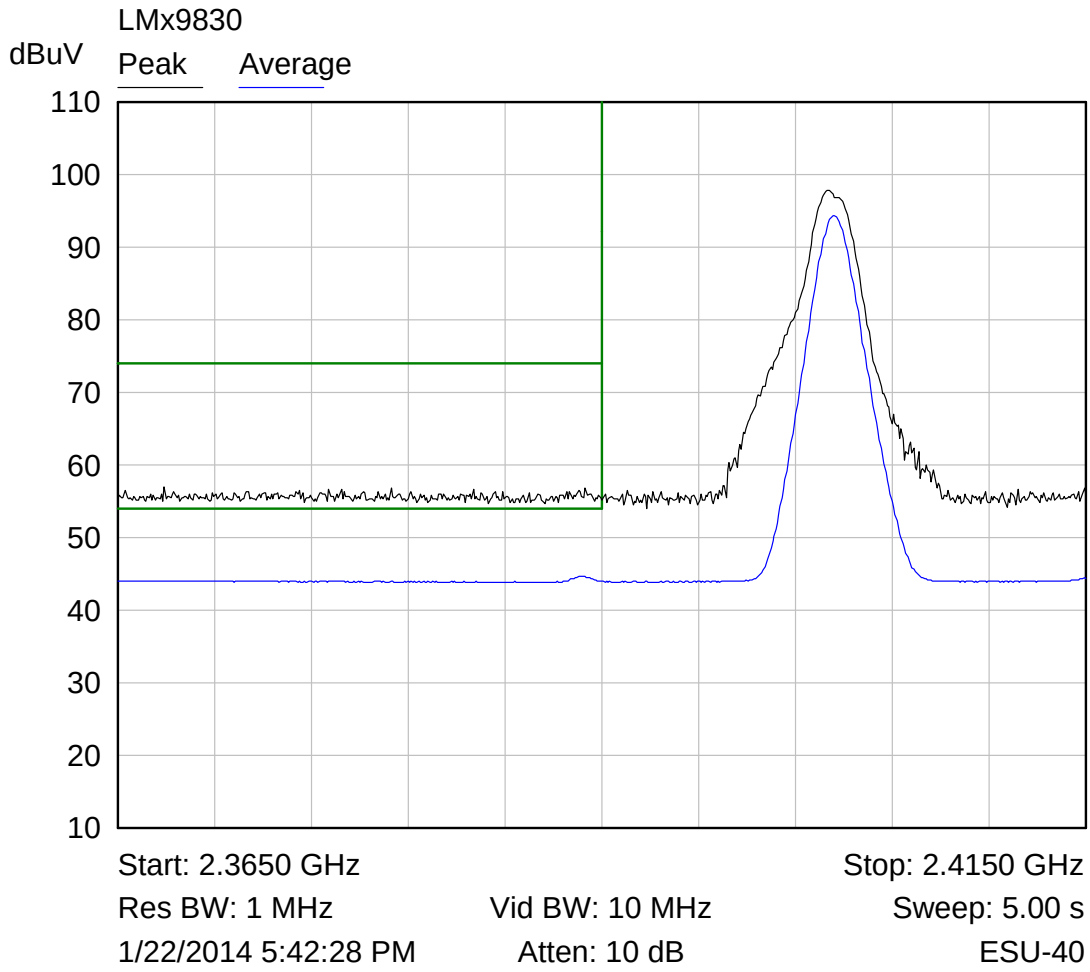
Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Duty Cycle Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4882.0	Peak	Vertical	23.0	37.8	0.0	60.8	74.0	-13.2
4882.0	Average	Vertical	6.2	37.8	0.0	44.0	54.0	-10.0
4882.0	Peak	Horizontal	23.1	37.8	0.0	60.9	74.0	-13.1
4882.0	Average	Horizontal	11.2	37.8	0.0	49.0	54.0	-5.0
7323.0	Peak	Vertical	16.1	42.1	0.0	58.2	74.0	-15.8
7323.0	Average	Vertical	-2.8	42.1	0.0	39.3	54.0	-14.7
7323.0	Peak	Horizontal	9.0	42.1	0.0	51.1	74.0	-22.9
7323.0	Average	Horizontal	-7.7	42.1	0.0	34.4	54.0	-19.6

Transmitting at the Highest Frequency (2480 MHz)

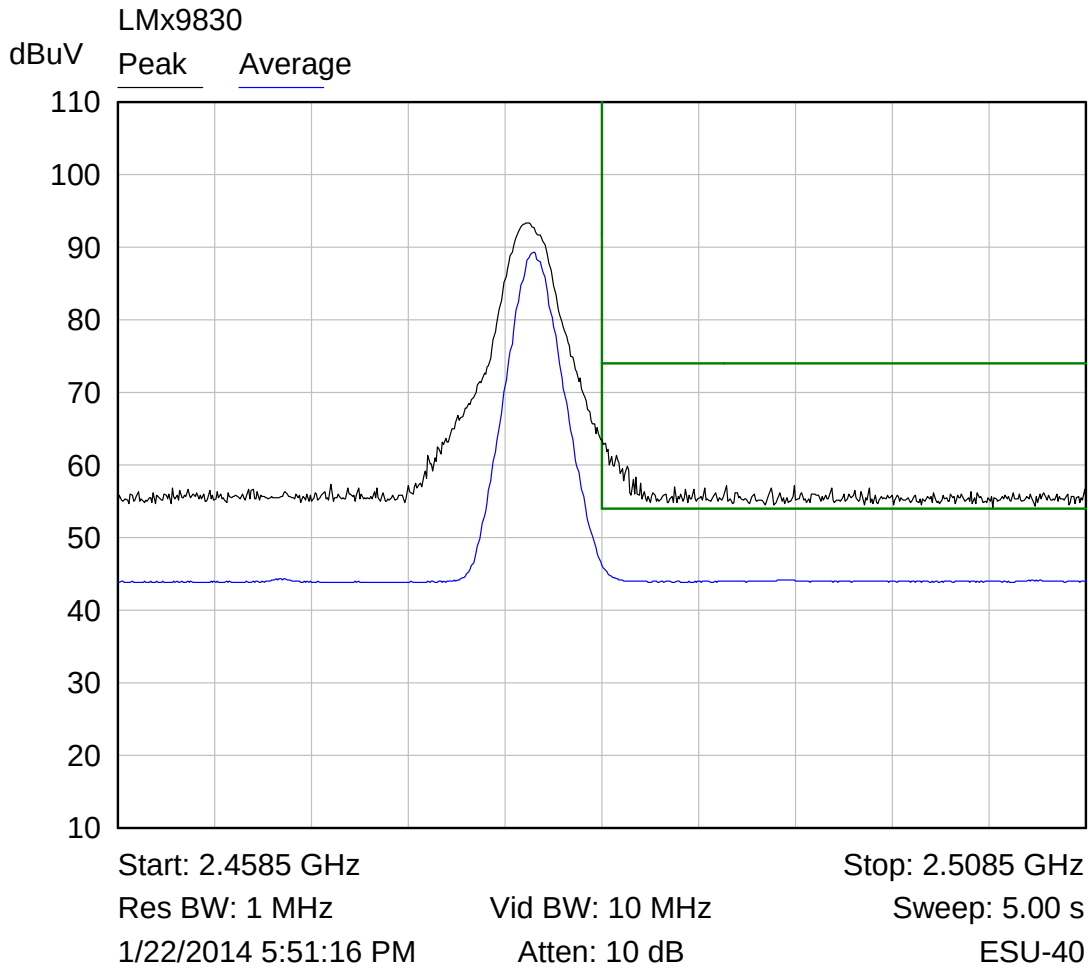
Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Duty Cycle Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4960.0	Peak	Vertical	19.6	37.9	0.0	57.5	74.0	-16.5
4960.0	Average	Vertical	0.1	37.9	0.0	38.0	54.0	-16.0
4960.0	Peak	Horizontal	18.1	37.9	0.0	56.0	74.0	-18.0
4960.0	Average	Horizontal	11.4	37.9	0.0	49.3	54.0	-4.7
7440.0	Peak	Vertical	8.5	42.4	0.0	50.9	74.0	-23.1
7440.0	Average	Vertical	-9.4	42.4	0.0	33.0	54.0	-21.0
7440.0	Peak	Horizontal	11.1	42.4	0.0	53.5	74.0	-20.5
7440.0	Average	Horizontal	-6.3	42.4	0.0	36.1	54.0	-17.9

No other radiated emissions were seen from the EUT.

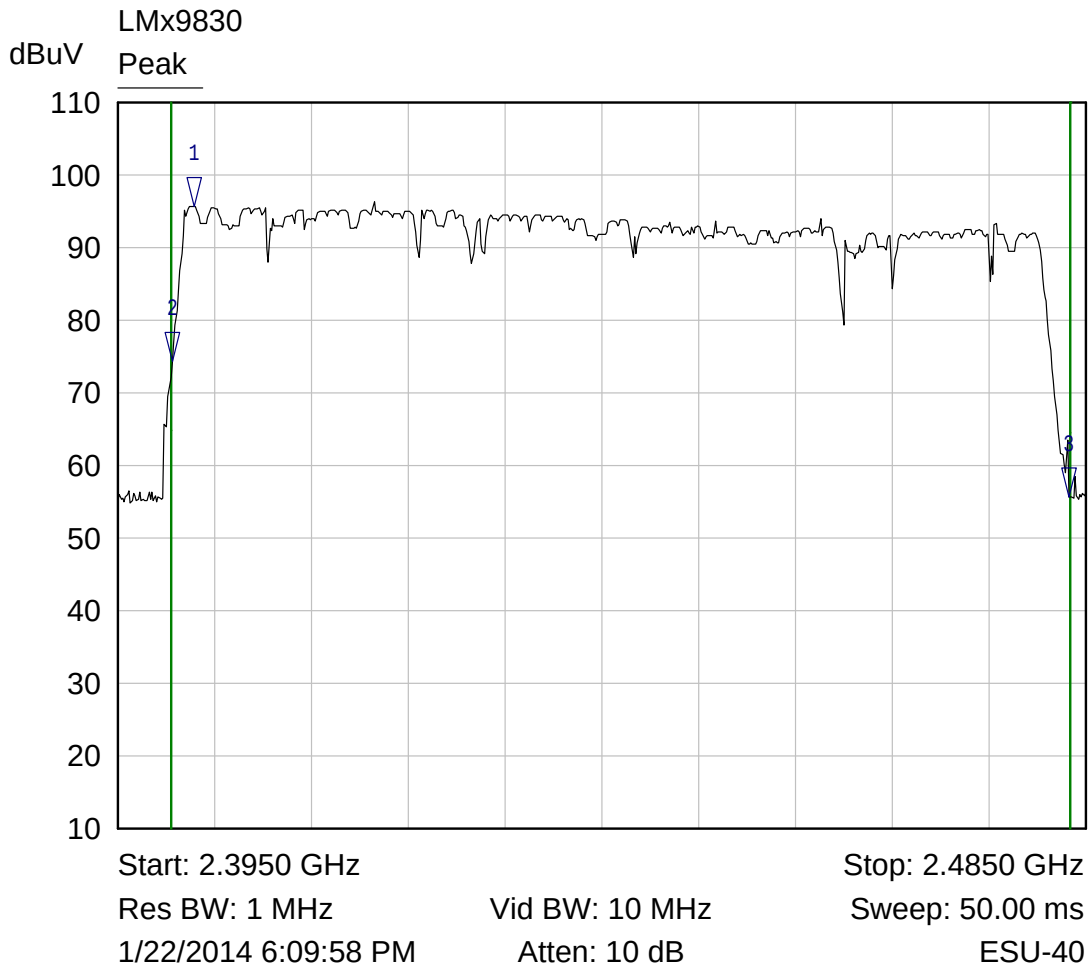
Lower Band Edge Plot



Upper Band Edge Plot



Plot of the Emission While Hopping



Mkr	Trace	X-Axis	Value	Notes
1 ▽	Peak	2.4021 GHz	95.68 dBuV	
2 ▽	Peak	2.4000 GHz	74.37 dBuV	
3 ▽	Peak	2.4834 GHz	55.71 dBuV	

RESULT

The spurious emissions met the limits specified in §15.209 and RSS-Gen Table 5 and Table 6; therefore, the EUT complies with the specification

APPENDIX 1 TEST PROCEDURES AND TEST EQUIPMENT

A1.1 Radiated Emissions

The radiated emissions from the intentional radiator were measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings.

A loop antenna was used to measure emissions below 30 MHz. Emission readings more than 20 dB below the limit at any frequency may not be listed in the reported data. For frequencies between 9 kHz and 30 MHz, or the lowest frequency generated or used in the device greater than 9 kHz, and less than 30 MHz, the spectrum analyzer resolution bandwidth was set to 9 kHz and the video bandwidth was set to 30 kHz. For average measurements, the spectrum analyzer average detector was used.

For frequencies above 30 MHz, an amplifier and preamplifier were used to increase the sensitivity of the measuring instrumentation. The quasi-peak adapter uses a bandwidth of 120 kHz, with the spectrum analyzer's resolution bandwidth set at 1 MHz, for readings in the 30 to 1000 MHz frequency ranges. For peak emissions above 1000 MHz the spectrum analyzer's resolution bandwidth was set to 1 MHz and the video bandwidth was set to 3 MHz. For average measurements above 1000 MHz the spectrum analyzer's resolution bandwidth was set to 1 MHz and the average detector of the analyzer was used.

A biconilog antenna was used to measure the frequency range of 30 to 1000 MHz and a Double Ridge Guide Horn antenna was used to measure the frequency range of 1 GHz to 18 GHz, and a Pyramidal Horn antenna was used to measure the frequency range of 18 GHz to 25 GHz, at a distance of 3 meters and/or 1 meter from the EUT. The readings obtained by the antenna are correlated to the levels obtained with a tuned dipole antenna by adding antenna factors.

The configuration of the EUT was varied to find the maximum radiated emission. The EUT was connected to the peripherals listed in Section 2.3 via the interconnecting cables listed in Section 2.4. A technician manually manipulated these interconnecting cables to obtain worst-case radiated disturbance. The EUT was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Where there were multiple interface ports all of the same type, cables are either placed on all of the ports or cables added to these ports until the emissions do not increase by more than 2 dB.

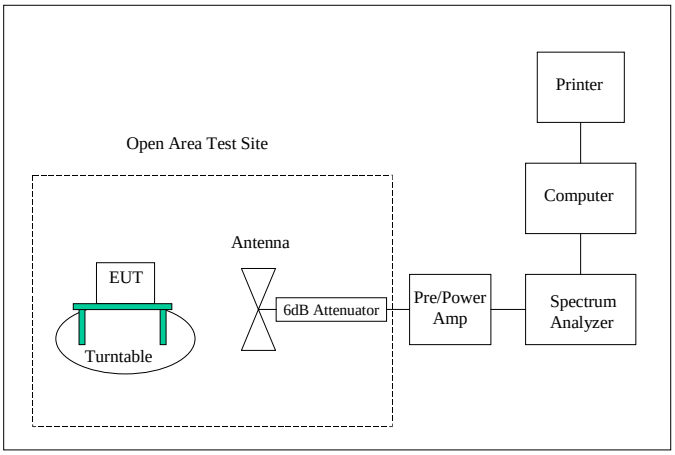
Desktop EUT are measured on a non-conducting table 0.8 meters above the ground plane. The table is placed on a turntable, which is level with the ground plane. For equipment normally placed on floors, the equipment shall be placed directly on the turntable.

For radiated emission testing at 30 MHz or above that is performed at distances closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

Type of Equipment	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Due Date of Calibration
Wanship Open Area Test Site #2	Nemko-CCL, Inc.	N/A	N/A	12/10/2013	12/10/2014
Test Software	Nemko-CCL, Inc.	Radiated Emissions	Revision 1.3	N/A	N/A
Spectrum Analyzer/Receiver	Rohde & Schwarz	ESU40	100064	07/24/2013	07/24/2014
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711	02/06/2013	02/06/2014
Quasi-Peak Detector	Hewlett Packard	85650A	2043A00137	02/06/2013	02/06/2014
Loop Antenna	EMCO	6502	9111-2675	03/04/2013	03/04/2015
Biconilog Antenna	EMCO	3142	9601-1008	10/10/2012	10/10/2014
Double Ridged Guide Antenna	EMCO	3115	9409-4355	06/06/2012	06/06/2014
2.4 GHz Filter	Microtronics	HPM50111-03	001	05/17/2013	05/17/2014
Pyramidal Standard Gain Horn	EMC Test System	3160-09	0003-1197	04/10/2009	ICO
High Frequency Amplifier	Miteq	AFS4-01001800-43-10P-4	1096455	05/06/2013	05/06/2014
20’ High Frequency Cable	Microcoax	UFB197C-1-3120-000000	1297	05/02/2013	05/02/2014
3 Meter Radiated Emissions Cable Wanship Site #2	Microcoax	UFB205A-0-4700-000000	1295	05/02/2013	05/02/2014
Pre/Power-Amplifier	Hewlett Packard	8447F	3113A05161	08/26/2013	08/26/2014
6 dB Attenuator	Hewlett Packard	8491A	32835	12/23/2013	12/23/2014

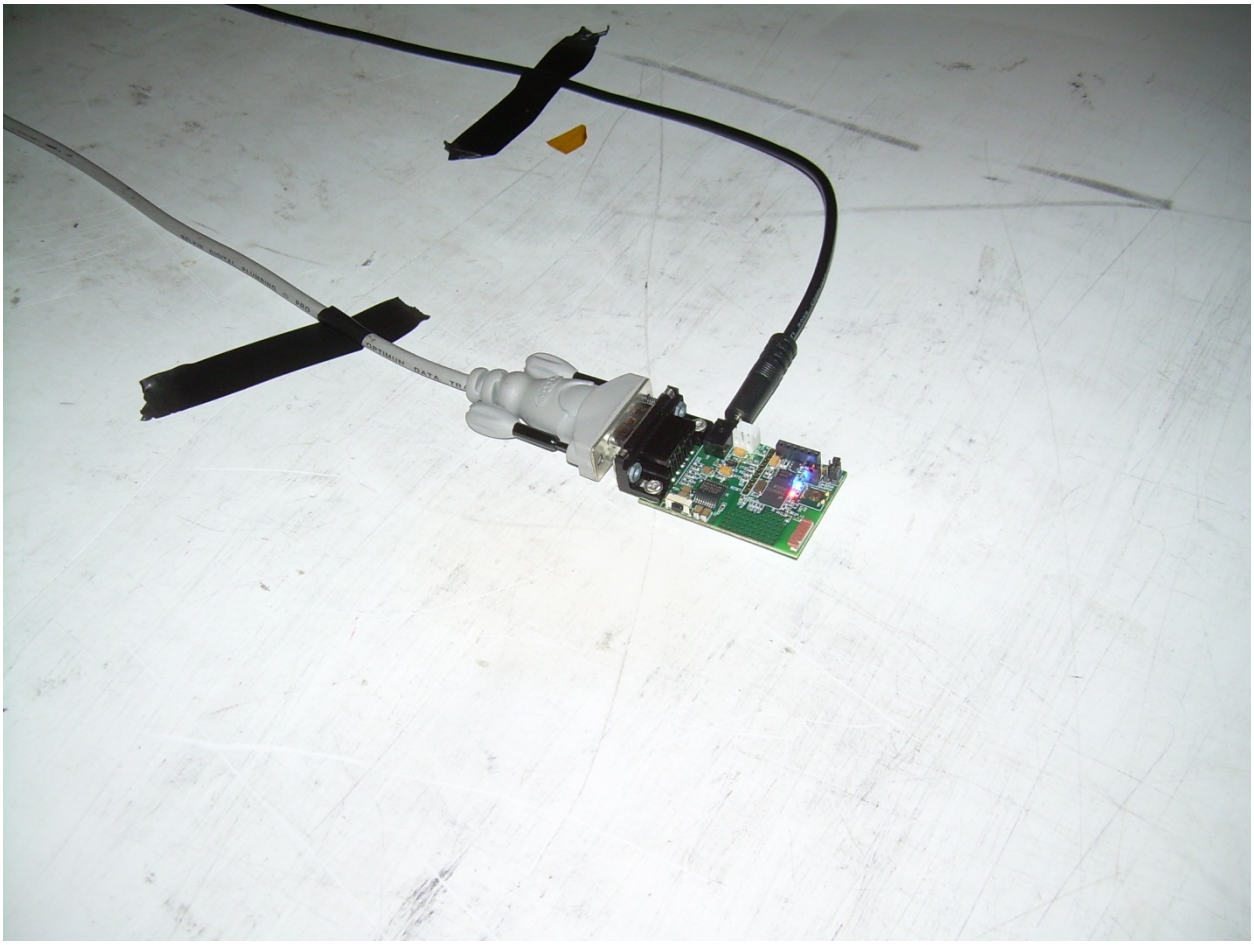
An independent calibration laboratory or Nemko-CCL, Inc. personnel calibrates all the equipment listed above at intervals defined in ANSI C63.4:2003 Section 4.4 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

Radiated Emissions Test Setup

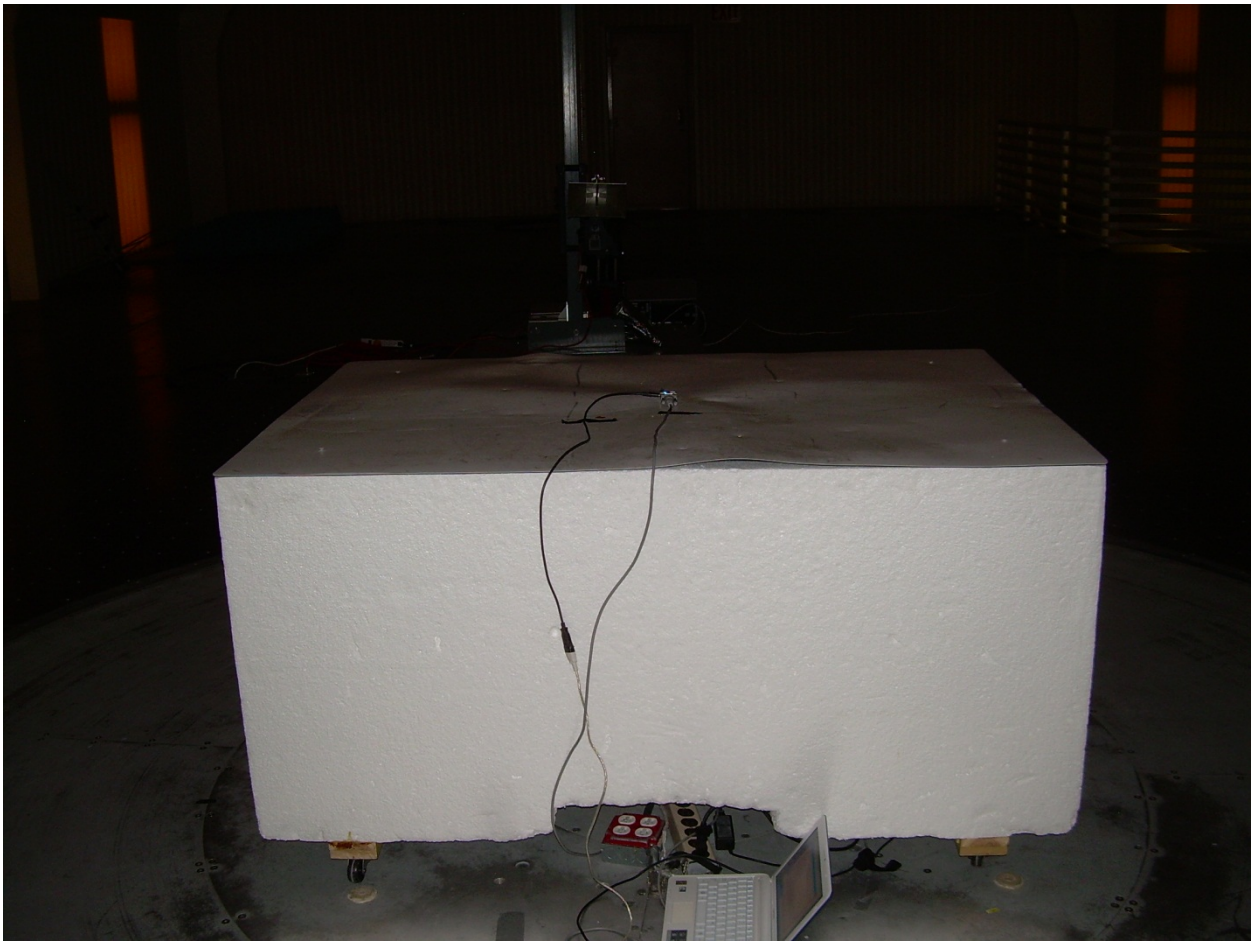


APPENDIX 2 PHOTOGRAPHS

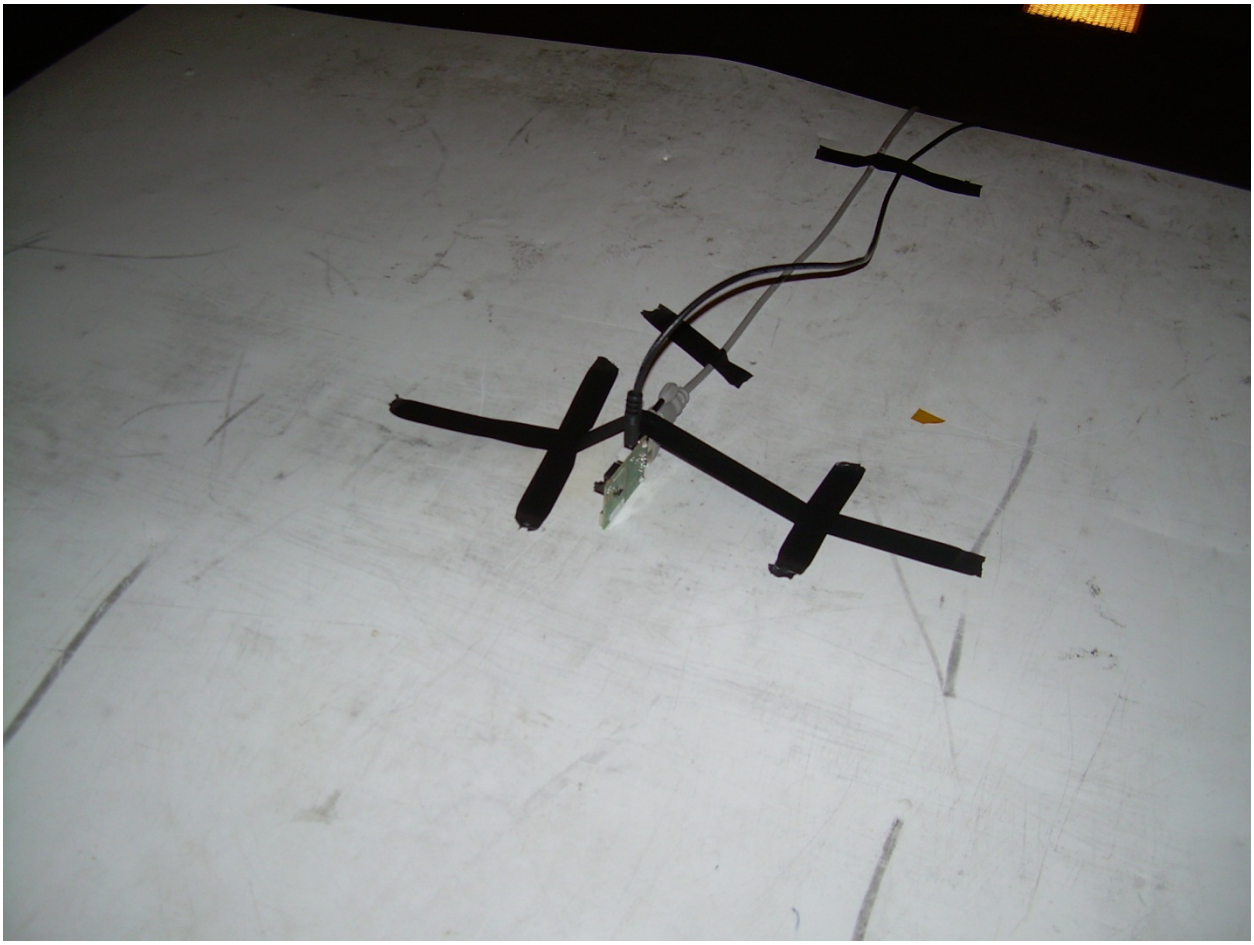
Photograph 1 – View of the Test Setup – Flat Orientation



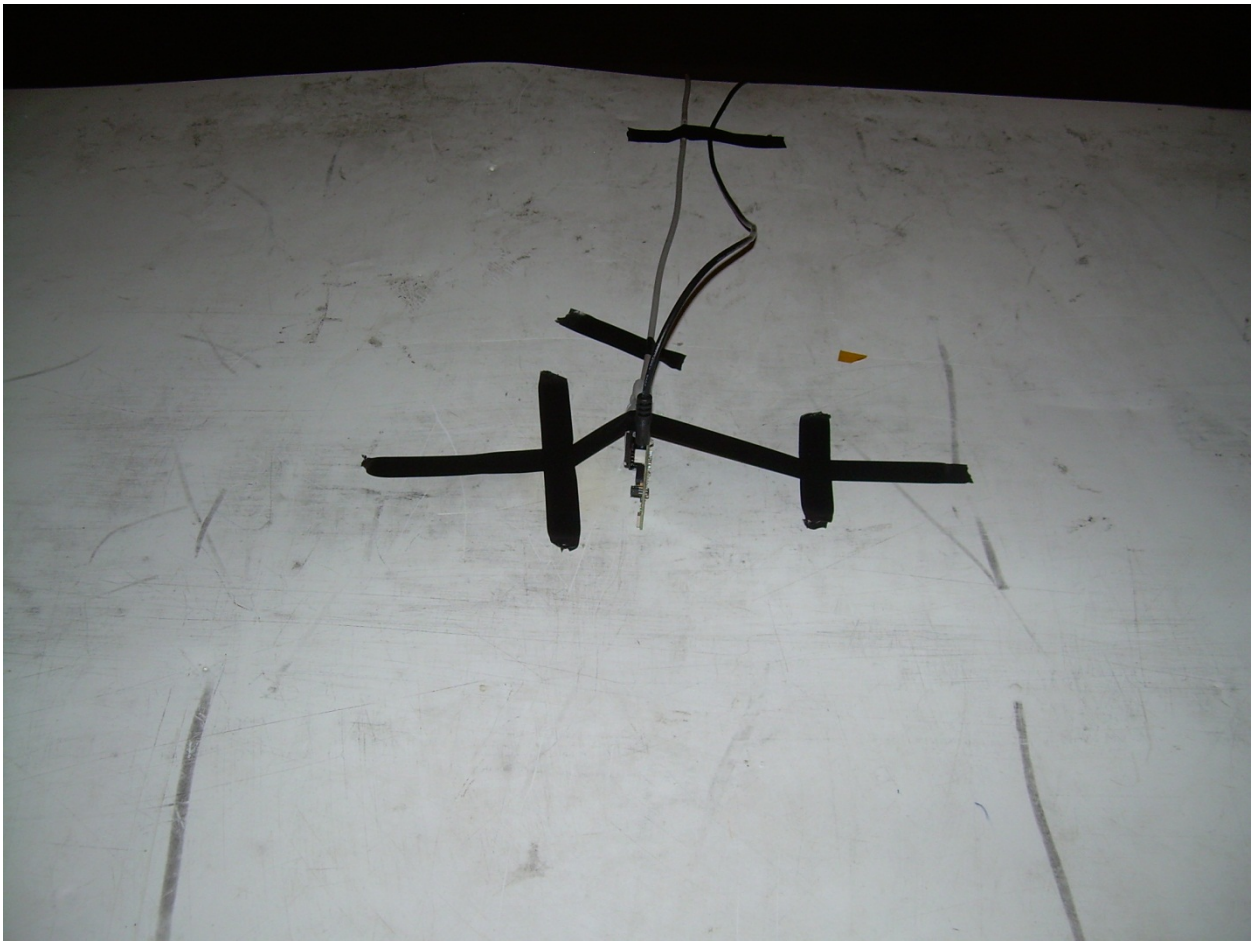
Photograph 2 – Back View of the Test Setup



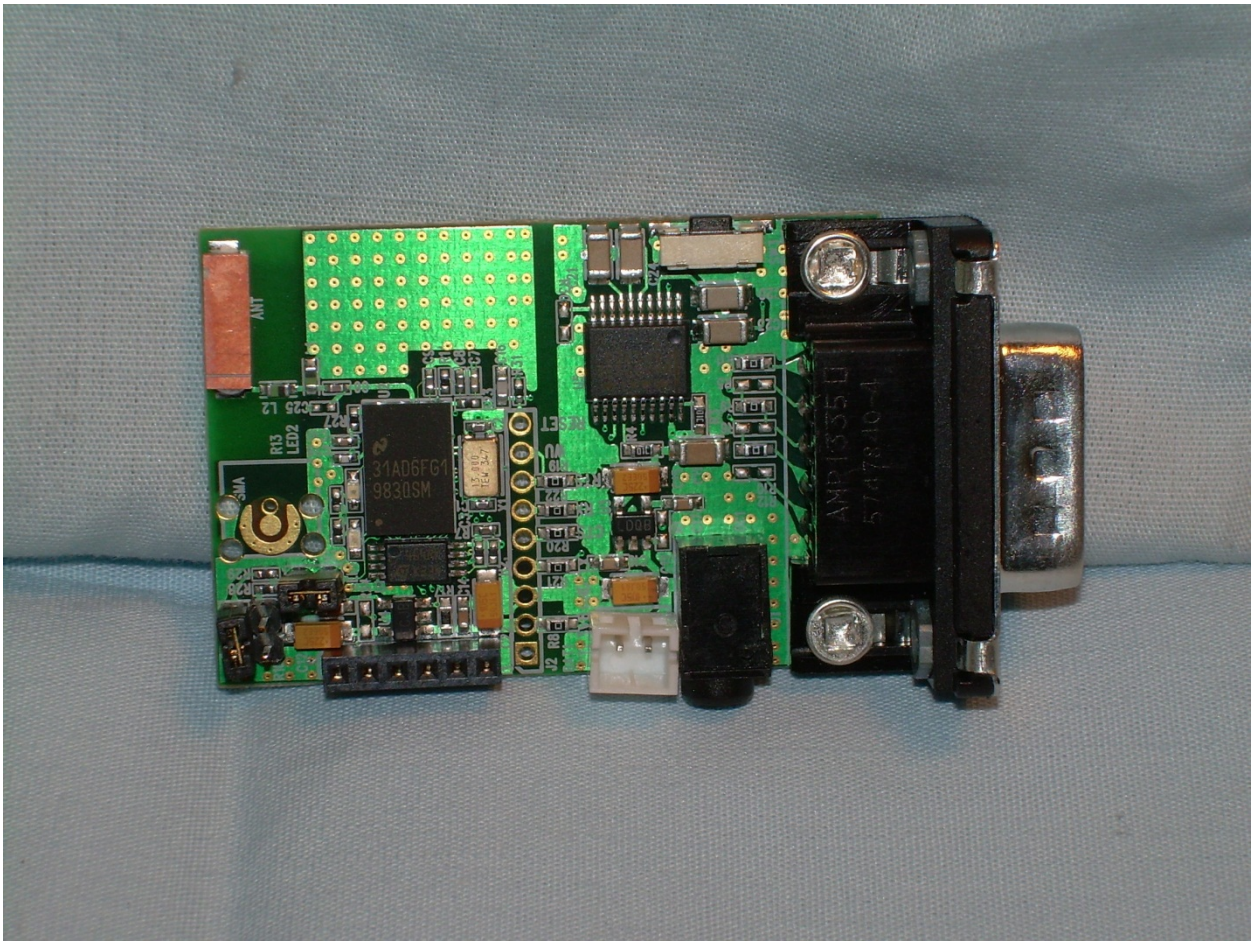
Photograph 3 – View of the Test Setup – On Edge Orientation



Photograph 4 – View of the Test Setup – Vertical Orientation



Photograph 5 – View of the Component Side of the EUT



Photograph 6 – View of the Trace Side of the EUT