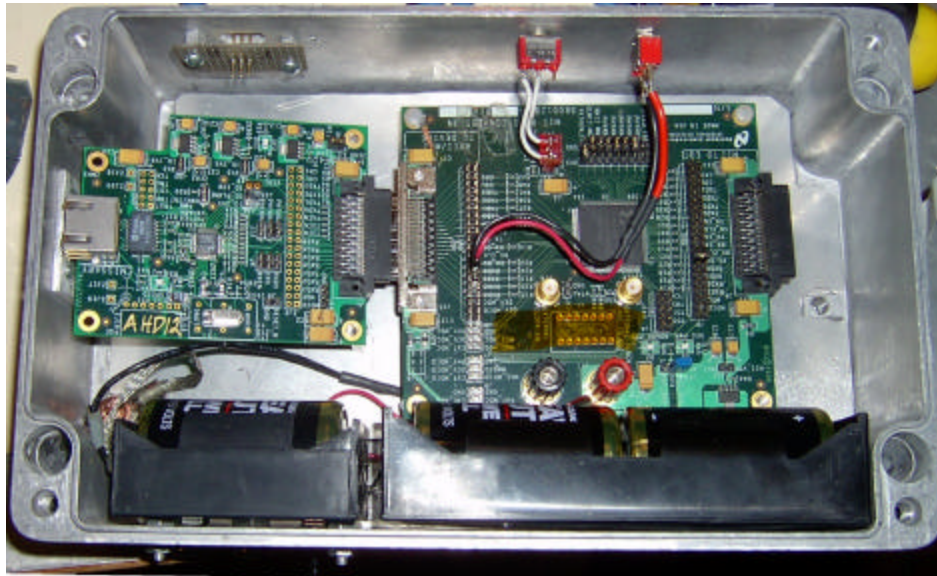


**EMC Test Report**

**#0801108ENB**

**Issued 4/2/08**



**Regarding the EN55022 B Testing of  
DP83640 ENGINEERING SAMPLE**

**CATEGORY: DIGITAL DEVICE**

**Judgment: EN55022 Compliant**

The information provided in this report also demonstrates  
EMC compliance to the Class B Requirements of

**FCC Part 15 Class B**

**CISPR 22, EN55022, and AS/NZS-3548**

Prepared for:

Dave Miller  
National Semiconductor Corp.  
500 Pinnacle Ct. Suite 525  
Norcross Ga 30071

Test Date(s):

March 7, 2008

Data recorded and report prepared by:

*Gordon L. Helm*

Gordon Helm, NCE

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## **STATEMENTS CONCERNING THIS REPORT**

### **NVLAP Accreditation: NVLAP Lab Code 200129-0**

The scope of AHD accreditation is the conducted emissions, radiated emissions test methods of:

IEC/CISPR 22: Limits and methods measurement of radio disturbance characteristics of information technology equipment.

FCC Method – 47 CFR Part 15: Digital Devices.

AS/NZS 3548: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment.

IEC61000-4-2 and Amend.1: ElectroStatic Discharge Immunity

IEC61000-4-5: Surge Immunity

### **Test Data:**

This test report contains data included in the scope of NVLAP accreditation.

### **Subcontracted Testing:**

This report does not contain data produced under subcontract.

### **Test Traceability:**

The calibration of all measuring and test equipment and the measured data using this equipment are traceable to the National Institute for Standards and Technology (NIST).

### **Limitations on results:**

The test results contained in this report relate only to the Item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require an evaluation to verify continued compliance.

### **Limitations on copying:**

This report shall not be reproduced, except in full, without the written approval of AHD.

### **Limitations of the report:**

This report shall not be used to claim product endorsement by NVLAP, FCC, or any agency of the US Government.

### **Statement of Test Results Uncertainty:**

Following the guidelines of NAMAS publication NIS81 and NIST Technical Note 1297, the Measurement Uncertainty at a 95% confidence level is determined to be: +/- 1.4 dB

### **Retention of Records:**

- 1) For equipment verified to comply with European Norme regulations, the manufacturer is obliged to retain the following records for ten years following the manufacture of the equipment model tested.
  1. This test report.
  2. Design drawings/schematics of the equipment.
  3. Record of design changes that may impact the compliance of the equipment.
  4. A record of the procedures used to assure production compliance [audits].

2) For equipment verified to comply with FCC regulations, the manufacturer is obliged to retain this report with the product records for two years following the manufacture of the equipment that was tested.

**Required user statements:** [Class B Digital Device or Peripheral]

- 1) For products satisfying all the European requirements,
  1. The CE conformity logo is to be placed on the device, and
  2. A Declaration of Conformity is to be issued with each device sold.
  
- 2) For products satisfying the FCC Part 15 Class B requirements the following are to be satisfied:
  1. The following statement is required to be labeled on the product or, if the device is too small, in the user's manual:

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*
  
  2. A statement is required to be placed in the User's Manual shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## **SUMMARY OF RESULTS**

1. The results of this test are applicable to the DP83640 Engineering Sample rev A2 only.
2. This configuration was evaluated using the EN55022 test procedures. Pursuant to FCC rules 15.31f, 15.109g this procedure is acceptable to demonstrate FCC compliance.
3. The tested system is compliant to the requirements of EN55022 for Class B Information Technology Equipment. The system is compliant to the requirements of FCC Part 15 for Class B Digital Devices.
4. The equipment under test was received on March 7, 2008 and this test series commenced on March 7, 2008.
5. Conducted emission level was not applicable as this is a battery powered device.
6. In data loopback operation of the DP83640 Engineering Sample the radiated emission level nearest the limit occurred at 225.0017MHz vertically polarized. This signal was measured to be 3.09dB below the Class B Quasi-peak limit.
7. In shielded cable data loopback operation of the DP83640 Engineering Sample the radiated emission level nearest the limit occurred at 225.001MHz horizontally polarized. This signal was measured to be 14.76dB below the Class B Quasi-peak limit.

### **Changes made to achieve compliance:**

1. NONE

## **EUT DESCRIPTION**

**Model:** DP83640 Engineering Sample

**Description:** DP83640 rev A2 engineering sample. All testing performed in 100MB MII mode. DUT driven by PLD based packet generator board, powered by batteries and enclosed in NEMA rated enclosure with the water seal replaced with conductive gasketing. Shielded testing performed with 4m shielded cat5 cable with loopback connection. Unshielded testing performed with 3 Meter unshielded cable above ground plane, beaded off below ground plane.

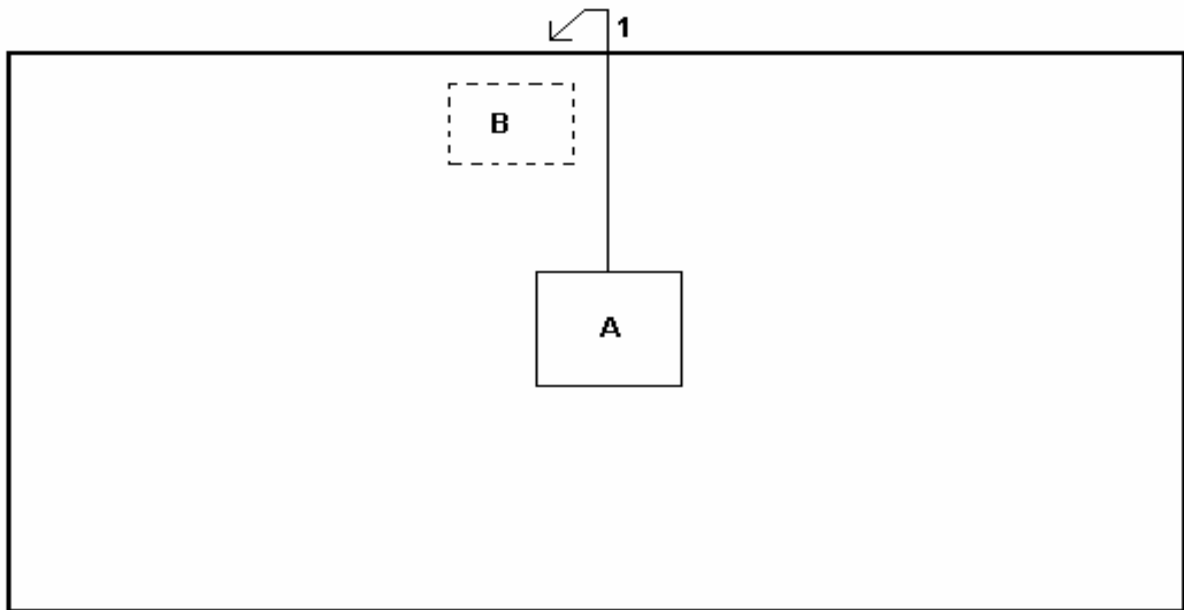
Main PCB: EMISSARY NCS © 2007  
PLD Module PCB: 9800128 MII CONVERSION

**Power Supply** 3 "D" cell batteries.

**EQUIPMENT TESTED:**

**Support Equipment & Cabling**

Setup Diagram Legend	Device	Model	Serial No. / Part No.	EMC Consideration
A	EUT Active Ethernet 100MB transmission	NSC DP83640	AHD12	Class B
A	EUT PLD Module	9800128 MII CONVERSION	N/A	Class B
A	Power Supply	3 "D" cell batteries	N/A	4.5V
B	Remote		N/A	4 Ferrite clamps each with 2 passes.
1	CAT 5 CABLE	multi-lead wiring	4 m	Un-Shielded



setup\_11

**BASIC EUT SETUP**  
(Legend designation is on the previous page)

**Setup Pictures**

Setup Block Diagram

This Page

Prescan Setup

Page 8

Remote Setup

Page 8

DP83640 Radiated Setup - Front & Rear Views

Page 9

### PRESCAN SETUP FOR RADIATED INVESTIGATION



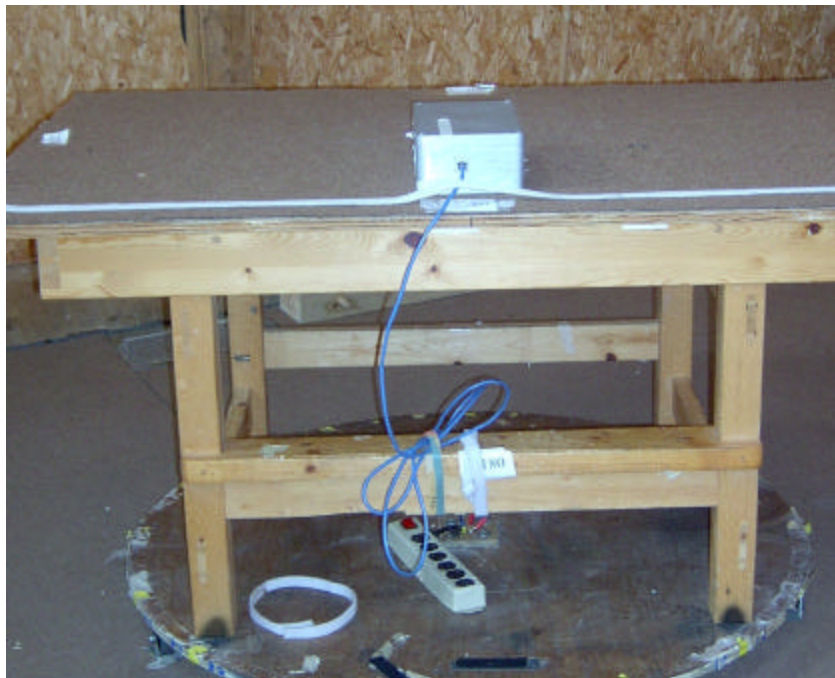
### REMOTE SETUP



**TR/TT 1120 Radiated Setup Front View**



**TR/TT 560 Radiated Setup Rear View**



## **MEASUREMENT REPORT**

### **Standards Applied to Test**

ANSI C63.4 – 2001

EN55022:1998,

AS/NZS 3548:1995 with Amendment 1/1997-01-05, Amendment 2/1997-06-05

FCC Part 15, 15.109g.

AHD test procedures TP0101-01, TP0102-01

### **Equipment Configuration**

For the testing, the placement of the EUT and the support equipment was selected to --

- 1) Be a representation of a configuration typical of user installation, and
- 2) Comply with the minimum system configuration of ANSI C63.4.

### **Test Methodology**

Radiated testing, performed at a 3 and 10 meter open field test site, were both completed according to the procedures in EN55022: 1998 with supporting instructions from ANSI C63.4. Please reference Appendix A for generic discussion on Test Methodology.

The ITE system under test was placed per ANSI C63.4

The EUT was exercised as follows:

1. DP83640 powered up, reset, and data checking verified.
2. Unit operating with loopback connection.
3. Measurements were made of the spurious emissions of the EUT

The cables were manipulated to produce the highest signal level relative to the limit.

The pictures, in the preceding pages, show the position of the equipment and cabling that produced the maximum signal level.

### **Variance from Test Procedure**

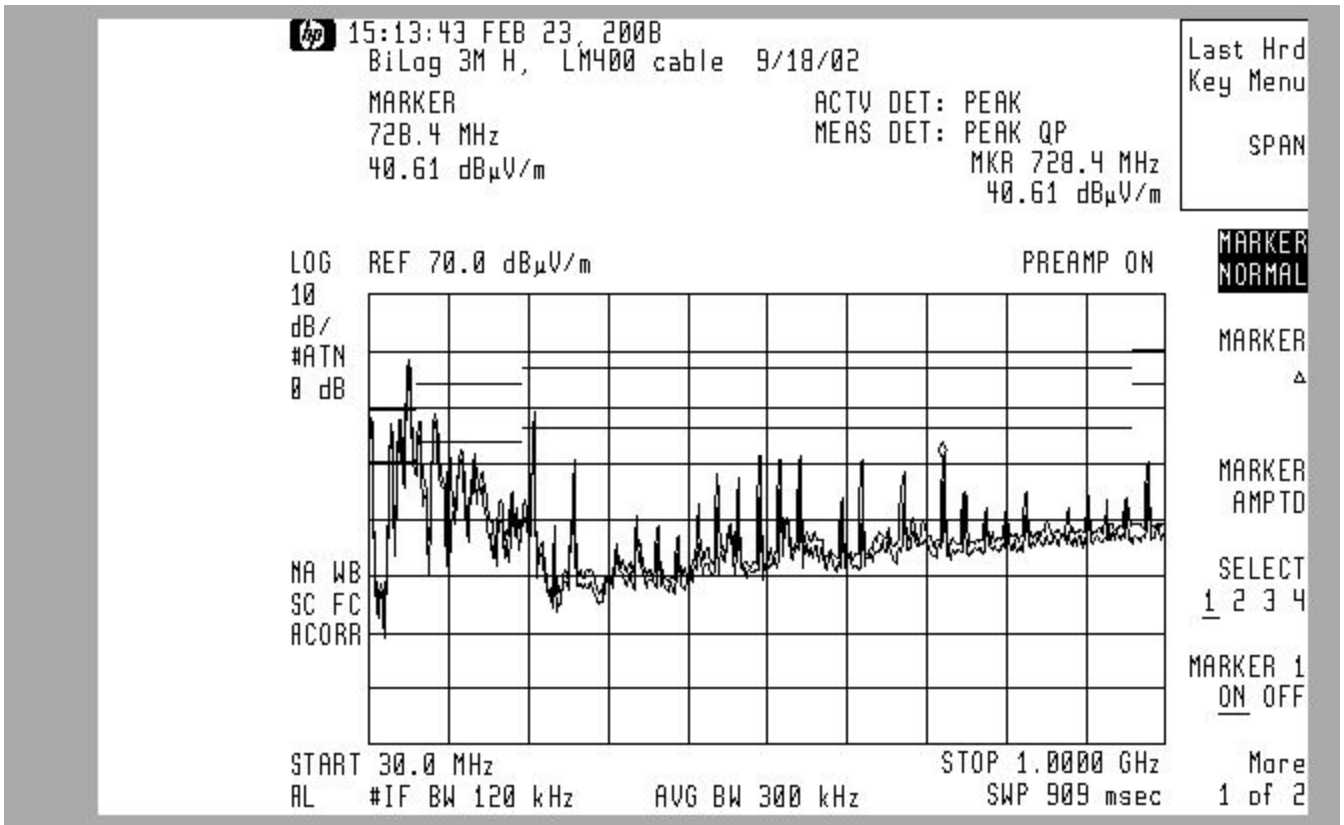
None.

## Test Data For DP83640 Radiated Field Strength Measurements

A scan of the EUT was made in a shielded room to study the emission profile of this EUT. This scan indicated low level spurious emissions from the unit.

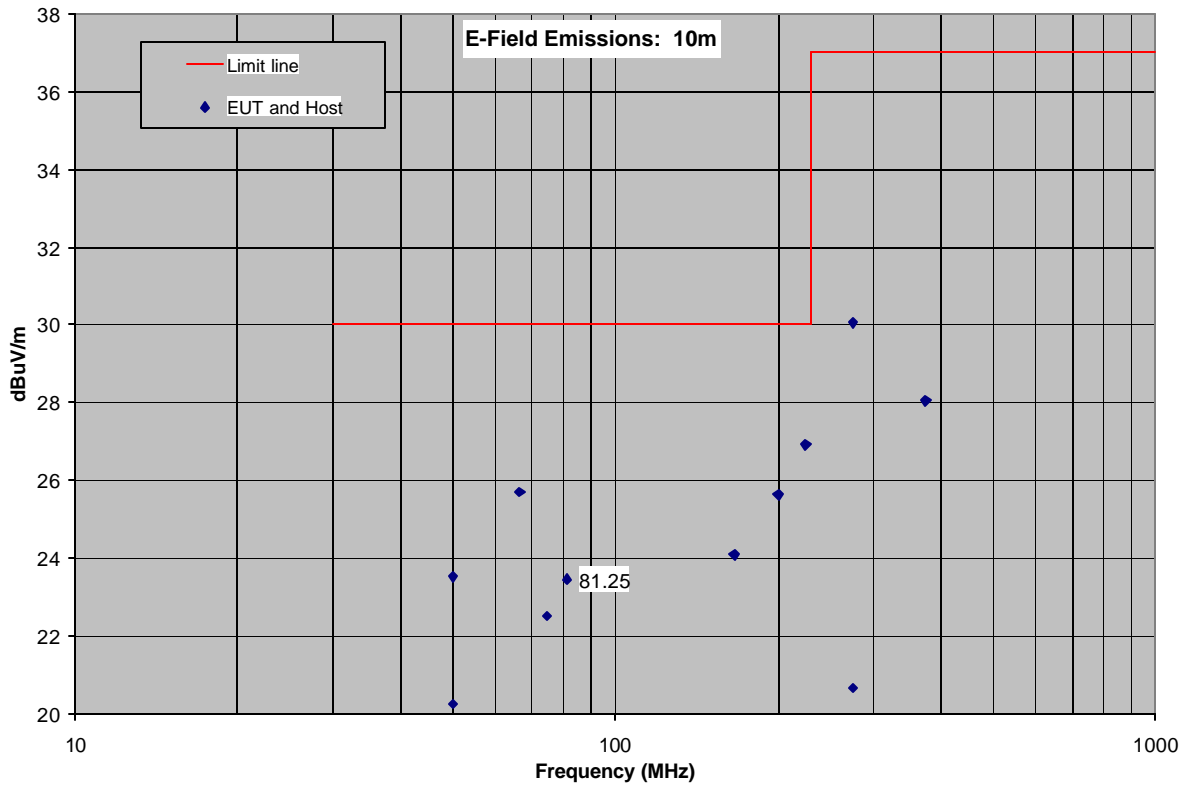
The suspect signals recorded in the shielded room prescan for each module were then measured at the 3-meter open area test site.

Emissions profile of the device as recorded while in a shielded enclosure.



Radiated Field Strength Measurements at 3m corrected to 10m:

EN55022/FCC Class B  
Graph of Quasi-Peak Measurements



Tabulated Quasi-Peak Measurements

Frequency MHz	Quasi Peak Measurement w/10.46dB 3m correction dBuV/m	Included Cable+Antenna Factors dB+dB/m	Antenna Polarization V/H	Turntable Azimuth deg	Antenna Height Mtr	FCC / EN55022 B Limit dBuV/m	Margin dB
66.49974	19.37	8.10	V	220	1.0	30	10.63
50.00234	19.82	10.35	V	270	1.0	30	10.18
50.00256	20.25	10.35	V	280	1.0	30	9.75
48.90598	17.55	10.73	V	270	1.0	30	12.45
49.99236	23.52	10.36	V	280	1.0	30	6.48
66.40869	25.7	8.12	V	260	1.0	30	4.3
74.58956	22.52	7.21	V	0	1.0	30	22.5
81.25459	23.45	7.51	H	290	2.0	30	6.55
49.04225	12.79	10.68	H	80	3.2	30	17.21
166.0422	24.09	10.08	H	180	4.0	30	5.91
125.0053	19.95	8.17	H	90	1.8	30	10.05
199.9858	25.63	11.47	H	100	2.3	30	4.37
225.0017	26.91	12.66	H	280	1.6	30	3.09
275.0035	30.06	14.69	H	90	1.0	37	6.94
374.9992	28.05	17.86	H	280	1.0	37	8.95
274.9939	20.66	12.3	V	170	1.0	37	16.34

Scanned to 1GHz

## Measurement Facilities & Equipment

### Test Site

The AHD test facility is centered on 9 acres of rural property near Sister Lakes, Michigan. The mailing address is 92723 Michigan Hwy152, Sister Lakes, 49047. This test facility is NVLAP accredited (LabCode 200129-0). It has been fully described in a report filed with the FCC (No.90413) and Industry Canada (file:IC3161).

### Measurement Equipment Used

Equipment	Model	S/N	Last Cal Date	Calibration Interval
HP EMI Receiver system	HP 8546A			
RF Filter Section	HP-85460A	3448A00283	21-June-07	12 months
RF Receiver Section	HP-85462A	3625A00342	21-June-07	12 months
EMCO BiconiLog Antenna	3142	1069	30-Aug-07	12 months
Solar LISN	8012-50-R-24-BNC	962137	30-Aug-07	12 months
Solar LISN	8012-50-R-24-BNC	962138	30-Aug-07	12 months
(LCI) Double shielded 50ohm Coax	RG58/U	920809	05-Mar-08	12 months
(3-m) LMR-400 Ultra Flex	LMR400	9812-11	09-Nov-07	6 months
(3-m) CS-3227 RG8	CS-3227	C060914	09-Nov-07	6 months
(10-m) Amelco 50ohm Coax	RG213U	9903-10ab	09-Nov-07	6 months
Double Ridged Horn	ONO91202-2	A00329	calibration by design & physical inspection.	
Wienschel Attenuator	200099	8950	05-Mar-08	12 months
AJFW Attenuator	50HF	803	05-Mar-08	12 months
EMCO Loop	6502	2148	01-Sept-06	36 months
Keytek Surge	711B	8511854	05-Mar-08	12 months
Schaffner ESD	NSG432	01027	02-Mar-08	12 months
HP Oscilloscope	54100D	2510A00511	07-Jan-08	12 months
Tektronix HV Probe	P6015	1324A1012	07-Jan-08	12 months

## Environment

The test was performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 24 deg.C, the relative humidity 38%.

## **APPENDIX A**

### **Measurement Procedures**

#### **Radiated**

The system was placed upon a 1 x 1.5 meter non-metallic table 80cm from the open field site ground plane in the prescribed setup per ANSI C63.4, Figure 9(c).

The table sits upon a remote controlled turntable. The receiving antenna, located at the appropriate standards distance of 3 or 10 meters from the table center, is also remote controlled.

The EUT was continuously exercised by software supplied by the manufacturer. Preliminary tests were done at the 3 meter open field test site. The final tests are done at the appropriate standards distance of 3 or 10 meters. The "Biconical/Log Periodic" broadband antenna connected to an EMI Receiver, meeting CISPR 16, is used throughout the testing.

During the preliminary scans and while monitoring the display of the EMI Receiver, the turntable was rotated 360 degrees and the receiving antenna height varied from 1 to 4 meters to search out the highest emissions. At the significant emissions, the cables were manipulated to determine a position that maximized the emissions being observed. Once the cable position was determined that presented the highest amplitude relative to the limit for Vertical polarized emissions the procedure was repeated for the Horizontal polarization.

The configuration that created an emission closest to the limit was used during the course of taking final measurements. Pictures of this final configuration are recorded in this report.

The principal settings of the EMI Receiver for radiated testing include:

Bandwidth:	120KHz
Detector Function:	scanning and signal search = Peak Mode measurements = Quasi Peak Mode.
Search Range:	30MHz to 1000MHz or to 2GHz as appropriate

The cable loss of the coax used in radiated scanning is charted in this appendix.

The antenna factors, for the test distance used, are charted in this appendix.

The resultant Field Strength (FS) is a summation in decibels (dB) of the Indicated Receiver Level (RF), the Antenna Correction Factor (AF), and the Cable Loss Factor (CF). If a PreAmplifier (PA) is used, its gain (dB) is subtracted from the above sum.

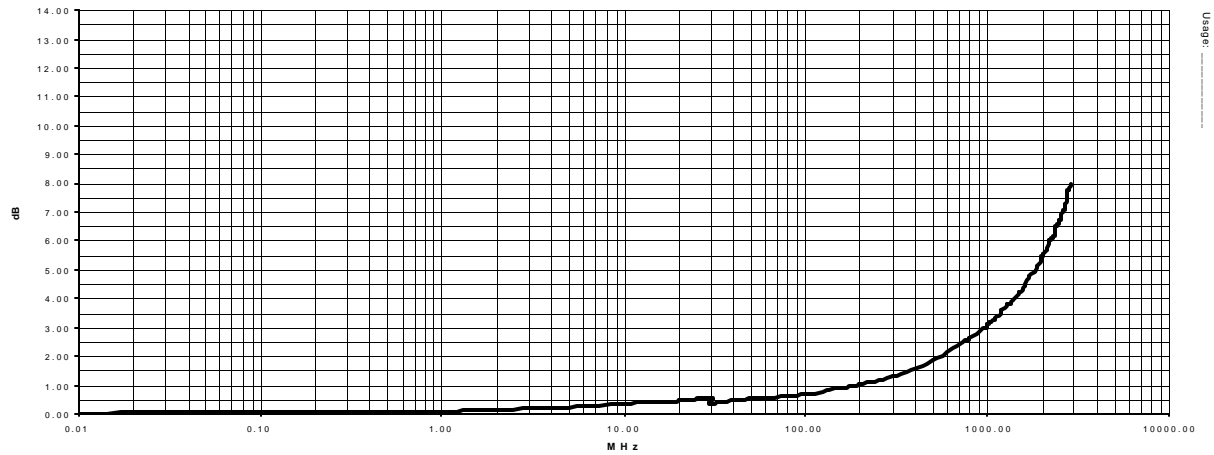
Formula 1: 
$$FS(\text{dBuV/m}) = RF(\text{dBuV}) + AF(\text{dB/m}) + CF(\text{dB}) - PA(\text{dB})$$

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: 
$$FS(\text{uV/m}) = \text{AntiLog}[(FS(\text{dBuV/m}))/20]$$

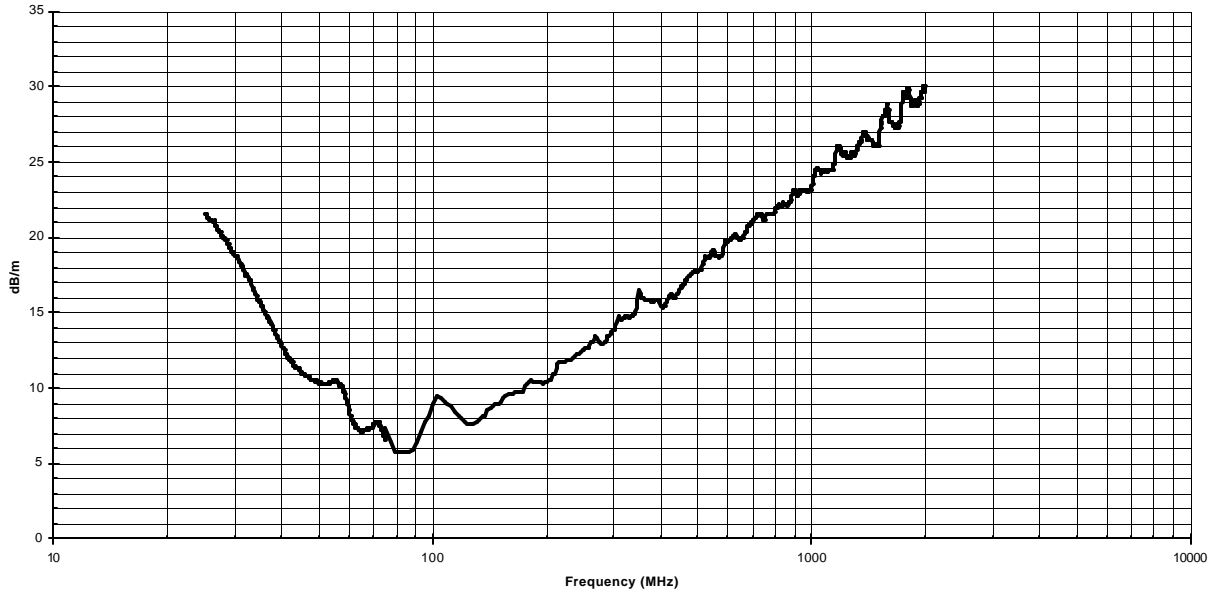
# Cable Loss

Radiated at 3 meters; 30MHz through 3000MHz, Coax #9812\_11  
Last Calibration date: Nov 9, 2007

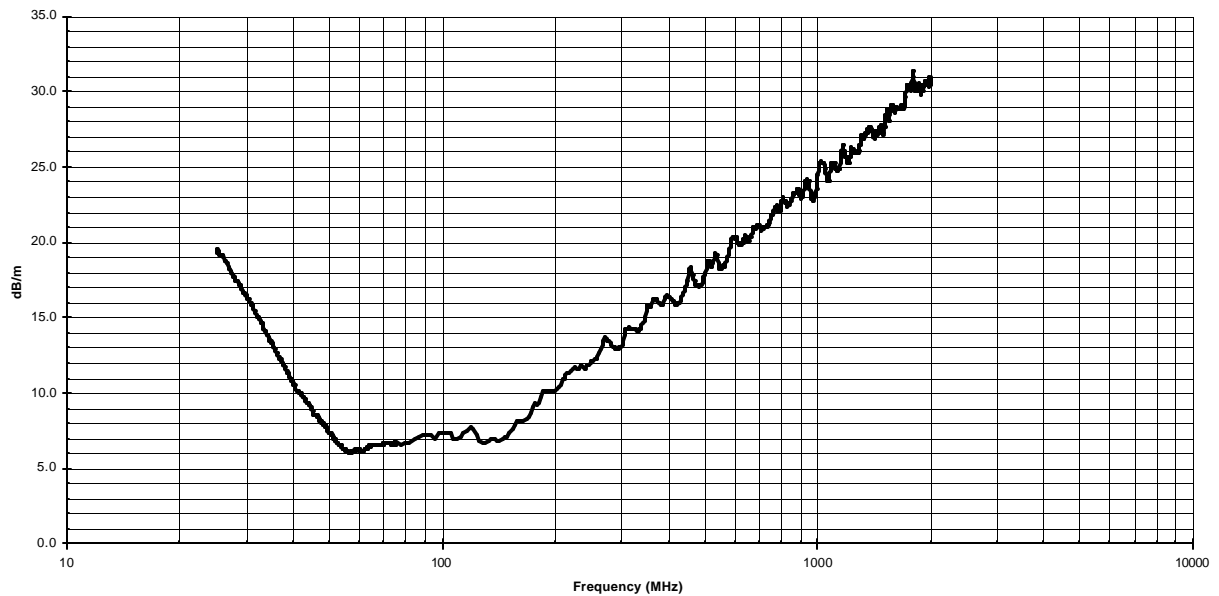


# Antenna Factors

EMCO Model 3142 Antenna #1069  
Last Calibration Date; August 30, 2007  
3 Meter Distance Factors




10 Meter Distance Factors



# AHD Accreditation

United States Department of Commerce  
National Institute of Standards and Technology



**Certificate of Accreditation to ISO/IEC 17025:2005**

NVLAP LAB CODE: 200129-0


**AHD (Amber Helm Development, L.C.)**  
Dowagiac, MI

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:*

**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-IAC-IAF Communiqué dated 18 June 2005).*

2007-07-01 through 2008-06-30  
Effective dates



*Jolly S. Busec*  
For the National Institute of Standards and Technology

NVLAP-01C (REV. 2006-09-13)

**FEDERAL COMMUNICATIONS COMMISSION**

Laboratory Division  
7435 Oakland Mills Road  
Columbia, MD 21046

May 17, 2005

Registration Number: 90413

AHD EMC Laboratory  
92723 M-152  
Dowagiac, MI 49047

Attention: Gordon Helm

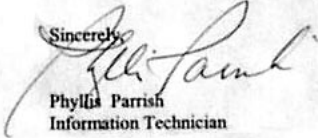
Re: Measurement facility located at Sister Lakes  
3 & 10 meter site  
Date of Renewal: May 17, 2005

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on 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,



Phyllis Parrish  
Information Technician

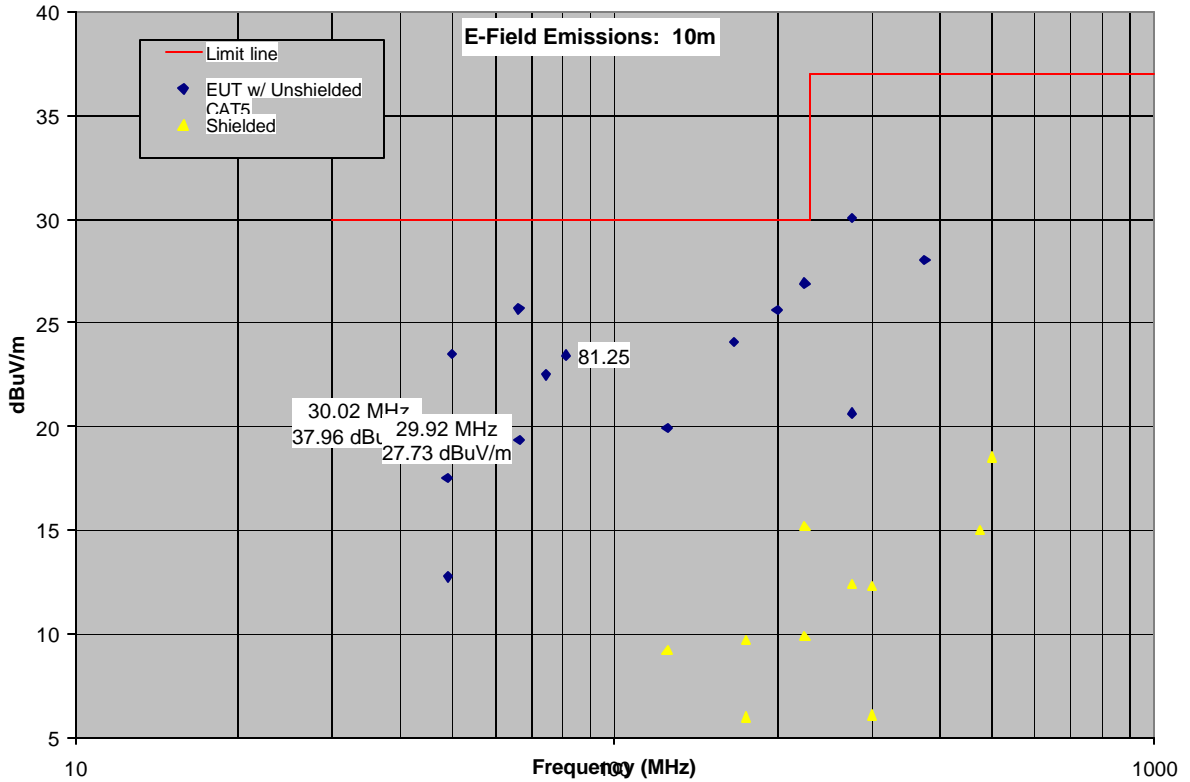
**NARTE Seal**

# ANNEX 1

This annex is to help document the result obtained with a shielded cable for environments where extra margin is needed to obtain EMC goals.

Radiated Field Strength Measurements at 3m corrected to 10m: Shielded measurements overlaid with unshielded.

EN55022/FCC Class B  
Graph of Quasi-Peak Measurements



Tabulated Quasi-Peak Measurements (Shielded)

Frequency MHz	Quasi Peak Measurement w/10.46dB 3m correction dBuV/m	Included Cable+Antenna Factors dB+dB/m	Antenna Polarization V/H	Turntable Azimuth deg	Antenna Height Mtr	FCC / EN55022 B Limit dBuV/m	Margin dB
225.0017	15.24	12.66	H	50	1.6	30	14.76
275.0035	12.44	14.69	H	290	1.6	37	24.56
475.0156	15.04	20.34	H	100	1.7	37	21.96
300.0083	6.14	15.59	H	300	1.5	37	30.86
175.0032	6.04	10.34	H	80	1.4	30	23.96
175.0032	9.74	10.34	V	0	1.0	30	20.26
300.0083	12.34	15.59	V	0	1.0	37	24.66
500.0999	18.54	21.38	V	170	1.0	37	18.46
225.0017	9.94	12.66	V	60	1.0	30	20.06
125.0066	9.24	8.17	V	0	1.0	30	20.76

Scanned to 1GHz