

Plexus

MA220E

August 05, 2003

Report No. PLEX0348

Report Prepared By:



1-888-EMI-CERT

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Test Report



22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test
Issue Date: August 05, 2003
Plexus
Model: MA220E

Emissions

Description	Pass	Fail
FCC Part 15.109 Class B:2000 Radiated Emissions	☒	☐
FCC Part 15.107 Class B:2003 Conducted Emissions	☒	☐
FCC Part 15.225 Field Strength of Fundamental	☒	☐
FCC Part 15.225 Field Strength of Spurious Emissions	☒	☐
FCC Part 15.225 Frequency Stability	☒	☐
FCC Part 15.207 AC Powerline Conducted Emissions	☒	☐

Modifications made to the product

- See the modifications page of the report

Test Facility

- The measurement facility used to collect the data is located at:

Northwest EMC, Inc.; 22975 NW Evergreen Parkway, Suite 400; Hillsboro, OR 97124
Phone: (503) 844-4066
Fax: 844-3826

This site has been fully described in a report filed with the FCC (Federal Communications Commission), and accepted by the FCC in a letter maintained in our files.

Approved By:

Greg Kiemel, Director of Engineering

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested, the specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
00	None		

FCC: The Open Area Test Sites, and conducted measurement facilities, have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files.



TCB: Northwest EMC has been accredited by ANSI to ISO/IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP: Accreditation has been granted to Northwest EMC, Inc. to perform the Electromagnetic Compatibility (EMC) tests described in the Scope of Accreditation. Assessment performed to ISO/IEC 17025. Certificate Number: 200629-0, Certificate Number: 200630-0.



Australia/New Zealand: The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body. (A2LA)



TÜV Product Service: Included in TÜV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TÜV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TÜV's current Listing of CARAT Laboratories available from TÜV. A certificate was issued to represent that this laboratory continues to meet TÜV's CARAT Program requirements. Certificate No. USA0302C



TÜV Rheinland: Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.



NEMKO: Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).



Technology International: Assessed in accordance with ISO Guide 25 defining the general international requirements for the competence of calibration and testing laboratories and with ITI assessment criteria LACO196. Based upon that assessment Interference Technology International, Ltd., has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC and amendments). The scope of the approval was provided on a Schedule of Assessment supplied with the certificate and is available upon request.



Industry Canada: Accredited by Industry Canada for performance of radiated measurements. Our open area test sites comply with RSP 100, Issue 7, section 3.3.



VCCI: Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. (Registration Nos. - Evergreen: C-1071 and R-1025, Trails End: C-694 and R-677, Sultan: C-905, R-871 and R-1172, North Sioux City C-1246, R-1185 and R-1217)



BSMI: Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement. License No.SL2-IN-E-1017.



CAB: Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement



GOST: Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification



	NVLAP	FCC	NIST	TUV PS	TUV Rheinland	Nemko	Technology International	Industry Canada	BSMI	VCCI	GOST	NATA
IEC 1000-4-2	✓			✓	✓	✓	✓					
IEC 1000-4-3	✓			✓	✓	✓	✓					
IEC 1000-4-4	✓			✓	✓	✓	✓					
IEC 1000-4-5	✓			✓	✓	✓	✓					
IEC 1000-4-6	✓			✓	✓	✓	✓					
IEC 1000-4-8	✓			✓	✓	✓	✓					
IEC 1000-4-11	✓			✓	✓	✓	✓					
IEC 1000-3-2	✓			✓	✓	✓	✓					
IEC 1000-3-3	✓			✓	✓	✓	✓					
AS/NZS 3548	✓											✓
CNS 13438	✓								✓			
ISO/IEC17025	✓			✓	✓	✓	✓		✓			
Radiated Emissions	✓			✓	✓	✓	✓	✓	✓	✓	✓	
Conducted Emissions	✓			✓	✓	✓	✓	✓	✓	✓	✓	
OATS Sites	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
Hillsboro 5-Meter Chamber (EV01)	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
TCB for Licensed Transmitters		✓										
TCB for un-Licensed Transmitters		✓										
Cab for R&TTE			✓									
CAB for EMC			✓									
This chart represents only a partial NVLAP Scope, please reference http://ts.nist.gov/ts/htdocs/210/214/214.htm for the full NVLAP Scope of Accreditation												

What is measurement uncertainty?

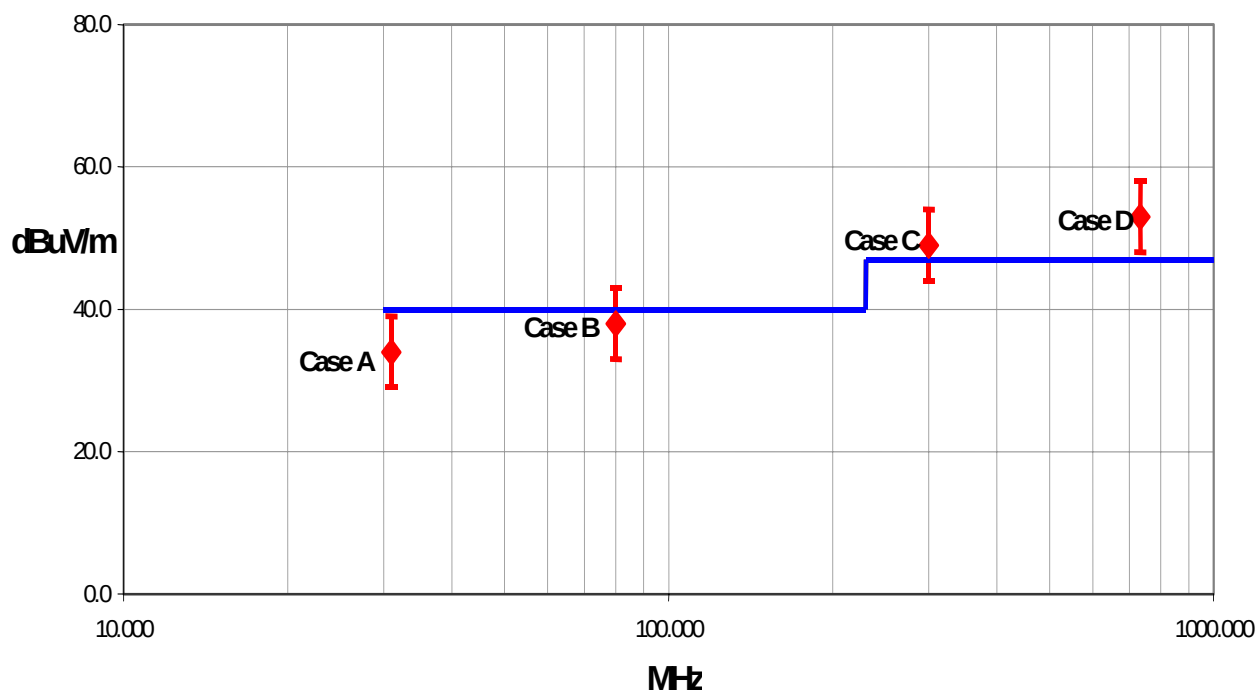
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" value. In the case of transient tests (ESD, EFT, Surge, Voltage Dips and Interruptions), the test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements.

The following documents were the basis for determining the uncertainty levels of our measurements:

- "ISO Guide to the Expression of Uncertainty in Measurements", October 1993
- "NIS81: The Treatment of Uncertainty in EMC Measurements", May 1994
- "IEC CISPR 16-3 A1 f1 Ed.1: Radio-interference measurements and statistical techniques", December 2000

How might measurement uncertainty be applied to test results?

If the diamond marks the measured value for the test and the vertical bars bracket the range of + and – measurement uncertainty, then test results can be interpreted from the diagram below.



Test Result Scenarios:

Case A: Product complies.

Case B: Product conditionally complies. It is not possible to say with 95% confidence that the product complies.

Case C: Product conditionally does not comply. It is not possible to say with 95% confidence that the product does not comply.

Case D: Product does not comply.

Radiated Emissions ≤ 1 GHz

Value (dB)

Test Distance	Probability Distribution	Biconical Antenna		Log Periodic Antenna		Dipole Antenna	
		3m	10m	3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.86 - 1.88	+ 1.82 - 1.87	+ 2.23 - 1.41	+ 1.29 - 1.26	+ 1.31 - 1.27	+ 1.25 - 1.25
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k=2)	+ 3.72 - 3.77	+ 3.64 - 3.73	+ 4.46 - 2.81	+ 2.59 - 2.52	+ 2.61 - 2.55	+ 2.49 - 2.49

Radiated Emissions > 1 GHz

Value (dB)

Test Distance	Probability Distribution	Without High Pass Filter		With High Pass Filter	
		3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.29 - 1.25	+ 1.29 - 1.25	+ 1.38 - 1.35	+ 1.38 - 1.35
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k=2)	+ 2.57 - 2.51	+ 2.57 - 2.51	+ 2.76 - 2.70	+ 2.76 - 2.70

Conducted Emissions

Test Distance	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.48
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k = 2)	2.97

Radiated Immunity

Test Distance	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.05
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k = 2)	2.11

Conducted Immunity

Test Distance	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.05
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k = 2)	2.10

Legend

$u_c(y)$ = square root of the sum of squares of the individual standard uncertainties

U = combined standard uncertainty multiplied by the coverage factor: k . This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required, then $k=3$ (CL of 99.7%) can be used. Please note that with a coverage factor of one, $u_c(y)$ yields a confidence level of only 68%.

**California****Orange County Facility**

41 Tesla Ave.
Irvine, CA 92618
(888) 364-2378
FAX (503) 844-3826

**Oregon****Evergreen Facility**

22975 NW Evergreen Pkwy.,
Suite 400
Hillsboro, OR 97124
(503) 844-4066
FAX (503) 844-3826

**Oregon****Trails End Facility**

30475 NE Trails End Lane
Newberg, OR 97132
(503) 844-4066
FAX (503) 537-0735

**South Dakota****North Sioux City Facility**

745 N. Derby Lane
P.O. Box 217
North Sioux City, SD 57049
(605) 232-5267
FAX (605) 232-3873

**Washington****Sultan Facility**

14128 339th Ave. SE
Sultan, WA 98294
(888) 364-2378
FAX (360) 793-2536

Party Requesting the Test

Company Name:	Plexus
Address:	21717 30th Drive S.E.
City, State, Zip:	Bothell, WA 98021
Test Requested By:	John Prieve
Model:	MA220E
First Date of Test:	07-18-2003
Last Date of Test:	07-30-2003
Receipt Date of Samples:	07-18-2003
Equipment Design Stage:	Production
Equipment Condition:	No visual damage.

Information Provided by the Party Requesting the Test

Clocks/Oscillators:	Not provided.
I/O Ports:	Serial, Ethernet, Wiegand

Functional Description of the EUT (Equipment Under Test):

Automatic fingerprint recognition terminal.

Client Justification for EUT Selection:

Not Provided

Client Justification for Test Selection

These tests satisfy the requirements for the FCC.

Equipment modifications				
Item #	Test	Date	Modification	Note
1	AC Power Line Conducted Emissions	07-18-2003	No EMI suppression devices were added or modified during this test.	Same configuration as delivered.
2	Spurious Radiated Emissions	07-18-2003	Ferrite 0444173551 clamped around all cables exiting EUT.	This modification is in addition to previous modifications.
3	Field Strength of Fundamental	07-19-2003	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test (Ferrite).
4	Frequency Stability	07-30-2003	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test (Ferrite).

Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Single

Operating Modes Investigated:

Typical

Antennas Investigated:

Integral

Data Rates Investigated:

Typical

Output Power Setting(s) Investigated:

Typical

Power Input Settings Investigated:

120 VAC, 60 Hz.

Software\Firmware Applied During Test

Exercise software	Morpho Access	Version	Unknown
Description			
The system was tested using standard operating modes, which do not require software.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Sagem	MA220E	SMU-0004
Power Adapter 1	Elpac Power Systems	FW3012	013283
Ferrite (on all cables)	N/A	0444173551	N/A

Remote Equipment

Description	Manufacturer	Model/Part Number	Serial Number
Remote laptop	Dell	PPX	N/A
USB Adapter	B&B Electronics	USTL4	N/A
Wiegand to Comm Adapter	N/A	N/A	N/A
Power Adapter 2	Dell	AA20031	0009364U

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Serial	No	0.5	Yes	EUT	Unterminated
DC Leads	PA	1.7	Yes	EUT	Power Adapter 1
AC Power	No	1.6	No	Power Adapter 1	AC Mains
AC Power	No	1.0	No	Power Adapter 2	AC Mains
DC Leads	PA	1.6	Yes	Remote laptop	Power Adapter 2
LAN	No	6.0	Yes	EUT	Remote laptop
Comm	PA	1.7	PA	Remote laptop	Wiegand to Comm Adapter
Keys/Mouse	PA	0.25	PA	Remote laptop/ Key/mouse port	Remote laptop/Comm port
Wiegand	PA	6.0	Yes	EUT	Wiegand to Comm Adapter
USB	Yes	1.3	No	USB Adapter	Remote laptop
Serial	Yes	6.0	Yes	EUT	USB Adapter

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	01/07/2003	12 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	01/07/2003	12 mo
Antenna, Loop	EMCO	6502	AOA	01/08/2002	36 mo

Test Description

Requirement: The field strength of the fundamental emission shall comply with the limits, as defined in 47 CFR 15.225. Field strength limits are specified at a distance of 30 meters.

Configuration: The only antenna to be used with the EUT was tested. The EUT was transmitting at its only available channel. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:1992).

The emissions were measured at both 3 meters and 5 meters. Per 15.31(f)(2), the results were extrapolated to 30 meters based upon the measured extrapolation factor. This factor was determined for each emission, at each antenna polarity.

Completed by:



OATS DATA SHEET

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
13.565	52.7	10.5	176.0	2.8	3.0	0.0	see comments	QP	25.2	38.0	80.0	-42.0
13.565	47.1	10.5	159.0	2.6	5.0	0.0	see comments	QP	19.6	38.0	80.0	-42.0
13.565	47.6	10.5	254.0	2.2	3.0	0.0	see comments	QP	22.1	36.0	80.0	-44.0
13.565	42.7	10.5	220.0	2.8	5.0	0.0	see comments	QP	17.2	36.0	80.0	-44.0
13.565	46.4	10.5	277.0	1.0	3.0	0.0	see comments	QP	42.4	14.5	80.0	-65.5
13.565	37.0	10.5	285.0	1.0	5.0	0.0	see comments	QP	33.0	14.5	80.0	-65.5

Distance Adjustment Factor for Radiated Emissions below 30 MHz

Method: Per 47 CFR 15.31(f)(2), the data was extrapolated based upon a the measured fall-off (at each frequency / polarity).

EUT: MA220E

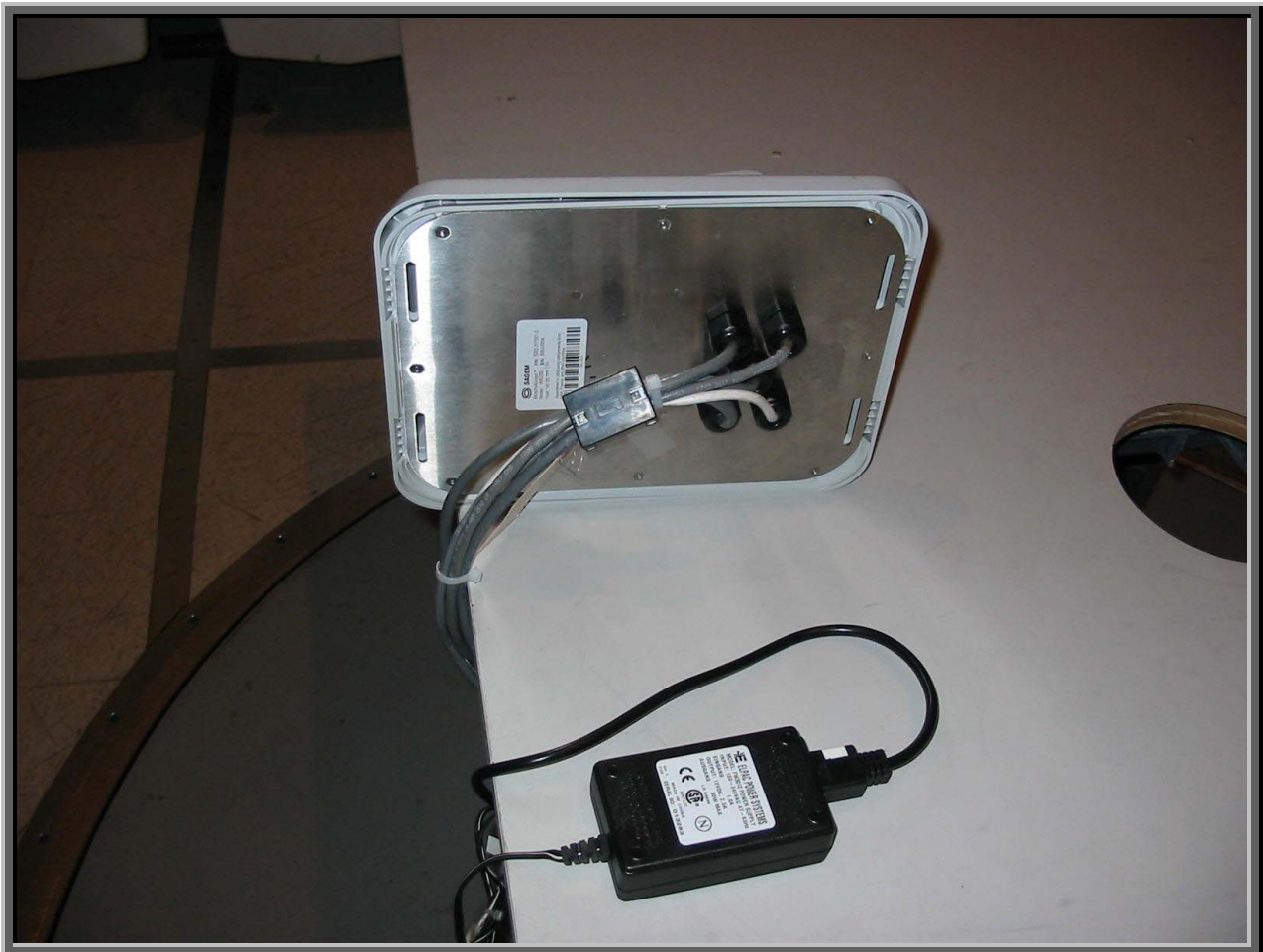
S/N:

Date: 7/18/2003

Job Number: PLEX0348

Frequency (MHz)	Loop Antenna Polarity	Test Distance (meters)	Adjusted Level (dBuV/m)	Fall-Off from 3 to 5 m (dB)	Extrapolation Factor for Specification Limit (dB / decade)	Test Distance of Spec. Limit (meters)	Distance Adjustment Factor (dB)
13.565	Par/Gnd, Perp/EUT	3	58.1	4.9	22.1	30.0	22.1
13.565	Par/Gnd, Perp/EUT	5	53.2				17.2
13.565	Perp/Gnd, Perp/EUT	3	56.9	9.4	42.4	30.0	42.4
13.565	Perp/Gnd, Perp/EUT	5	47.5				33.0
13.565	Perp/Gnd, Par/EUT	3	63.2	5.6	25.2	30.0	25.2
13.565	Perp/Gnd, Par/EUT	5	57.6				19.6





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Single

Operating Modes Investigated:

Typical

Antennas Investigated:

Integral

Data Rates Investigated:

Typical

Output Power Setting(s) Investigated:

Typical

Power Input Settings Investigated:

120 VAC, 60 Hz.

Frequency Range Investigated

Start Frequency	10 kHz	Stop Frequency	1 GHz
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Software\Firmware Applied During Test

Exercise software	Morpho Access	Version	Unknown
Description			
The system was tested using standard operating modes, which do not require software.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
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Power Adapter 2	Dell	AA20031	0009364U

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AC Power	No	1.0	No	Power Adapter 2	AC Mains
DC Leads	PA	1.6	Yes	Remote laptop	Power Adapter 2
LAN	No	6.0	Yes	EUT	Remote laptop
Comm	PA	1.7	PA	Remote laptop	Wiegand to Comm Adapter
Keys/Mouse	PA	0.25	PA	Remote laptop/ Key/mouse port	Remote laptop/Comm port
Wiegand	PA	6.0	Yes	EUT	Wiegand to Comm Adapter
USB	Yes	1.3	No	USB Adapter	Remote laptop
Serial	Yes	6.0	Yes	EUT	USB Adapter

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

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Spectrum Analyzer	Hewlett-Packard	8566B	AAL	01/07/2003	12 mo
Antenna, Loop	EMCO	6502	AOA	01/08/2002	36 mo
Antenna, Biconilog	EMCO	3141	AXE	12/31/2001	36 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	01/06/2003	12 mo

Test Description

Requirement: Per 47 CFR 15.225, the field strength of any emissions outside the band of 13.553 – 13.567 MHz shall comply with the limits as defined in 47 CFR 15.209.

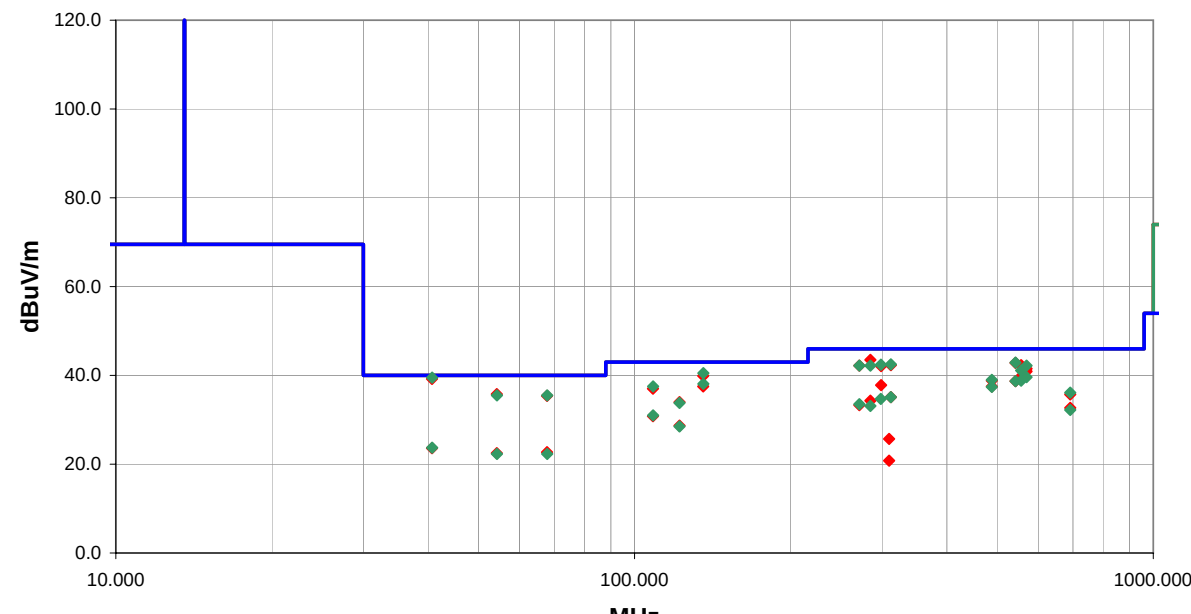
Configuration: The only antenna to be used with the EUT was tested. The EUT was transmitting at its only available channel. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:1992).

Below 30 MHz, the emissions were measured at both 3 meters and 5 meters. Per 15.31(f)(2), the results were extrapolated to the specification test distance (either 30 or 300 meters) based upon the measured extrapolation factor. This factor was determined for each emission, at each antenna polarity.

Above 30 MHz, the emissions were measured at 3 meters and compared to the 3-meter limit. No extrapolation factor was required.

Completed by:



NORTHWEST		REV d3.11 06/23/2003										
EMC		OATS DATA SHEET										
EUT: MA220E		Work Order: PLEX0348										
Serial Number: SMU-0004		Date: 07/25/03										
Customer: Plexus		Temperature: 75										
Attendees: John Prieve		Humidity: 37%										
Cust. Ref. No.:		Barometric Pressure: 29.99										
Tested by: Dan Haas		Power: 120VAC, 60Hz	Job Site: EV01									
TEST SPECIFICATIONS												
Specification: FCC Part 15.225		Year: 2000										
Method: ANSI C63.4		Year: 1992										
SAMPLE CALCULATIONS												
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation												
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator												
COMMENTS												
Serial, Wiegand, LAN run to remote PC. ferrite on all cables. Longer Mifare interface cable w/ 2 turn ferrite (Fair-Rite, PN:PN:PN:0431173951).												
EUT OPERATING MODES												
Scan ready mode												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS			Run #									
Pass			8									
Other												
			 Tested By:									
												
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
40.696	60.1	-20.9	59.0	1.0	3.0	0.0	V-Bilog	PK	0.0	39.2	40.0	-0.8
284.869	57.9	-14.4	156.0	1.0	3.0	0.0	H-Bilog	PK	0.0	43.5	46.0	-2.5
135.652	59.5	-19.6	162.0	1.0	3.0	0.0	V-Bilog	PK	0.0	39.9	43.0	-3.1
542.608	51.2	-8.4	350.0	1.0	3.0	0.0	V-Bilog	PK	0.0	42.8	46.0	-3.2
556.173	50.4	-8.1	360.0	1.0	3.0	0.0	V-Bilog	PK	0.0	42.3	46.0	-3.7
312.000	55.7	-13.4	309.0	1.0	3.0	0.0	H-Bilog	PK	0.0	42.3	46.0	-3.7
271.304	57.3	-15.1	299.0	1.0	3.0	0.0	H-Bilog	PK	0.0	42.2	46.0	-3.8
298.814	55.9	-13.8	142.0	1.0	3.0	0.0	H-Bilog	PK	0.0	42.1	46.0	-3.9
54.261	57.8	-22.0	11.0	1.0	3.0	0.0	V-Bilog	PK	0.0	35.8	40.0	-4.2
569.740	49.3	-7.8	343.0	1.0	3.0	0.0	V-Bilog	PK	0.0	41.5	46.0	-4.5
67.826	56.2	-20.8	189.0	1.0	3.0	0.0	V-Bilog	PK	0.0	35.4	40.0	-4.6
569.740	48.7	-7.8	329.0	1.5	3.0	0.0	H-Bilog	PK	0.0	40.9	46.0	-5.1
135.652	57.1	-19.6	314.0	2.2	3.0	0.0	H-Bilog	PK	0.0	37.5	43.0	-5.5
108.524	56.3	-19.3	318.0	1.0	3.0	0.0	V-Bilog	PK	0.0	37.0	43.0	-6.0
556.173	47.9	-8.1	297.0	1.6	3.0	0.0	H-Bilog	PK	0.0	39.8	46.0	-6.2
488.346	48.2	-9.4	304.0	1.8	3.0	0.0	H-Bilog	PK	0.0	38.8	46.0	-7.2
542.608	47.1	-8.4	314.0	1.6	3.0	0.0	H-Bilog	PK	0.0	38.7	46.0	-7.3
298.814	51.6	-13.8	266.0	1.6	3.0	0.0	V-Bilog	PK	0.0	37.8	46.0	-8.2
488.346	46.9	-9.4	309.0	1.0	3.0	0.0	V-Bilog	PK	0.0	37.5	46.0	-8.5
122.087	53.7	-19.7	149.0	1.9	3.0	0.0	H-Bilog	PK	0.0	34.0	43.0	-9.0

NORTHWEST

EMC

REV
d3.11
06/23/2003

OATS DATA SHEET

EUT:	MA220E	Work Order:	PLEX0348
Serial Number:	SMU-0004	Date:	07/25/03
Customer:	Plexus	Temperature:	75
Attendees:		Humidity:	39%
Cust. Ref. No.:		Barometric Pressure	30.06
Tested by:	Dan Haas	Power:	120VAC, 60Hz
		Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC Part 15.225	Year:	2000
Method:	ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

Serial, Wiegand, Ethernet run to remote PC. Ferrite on all cables.

EUT OPERATING MODES

Scan ready mode

DEVIATIONS FROM TEST STANDARD

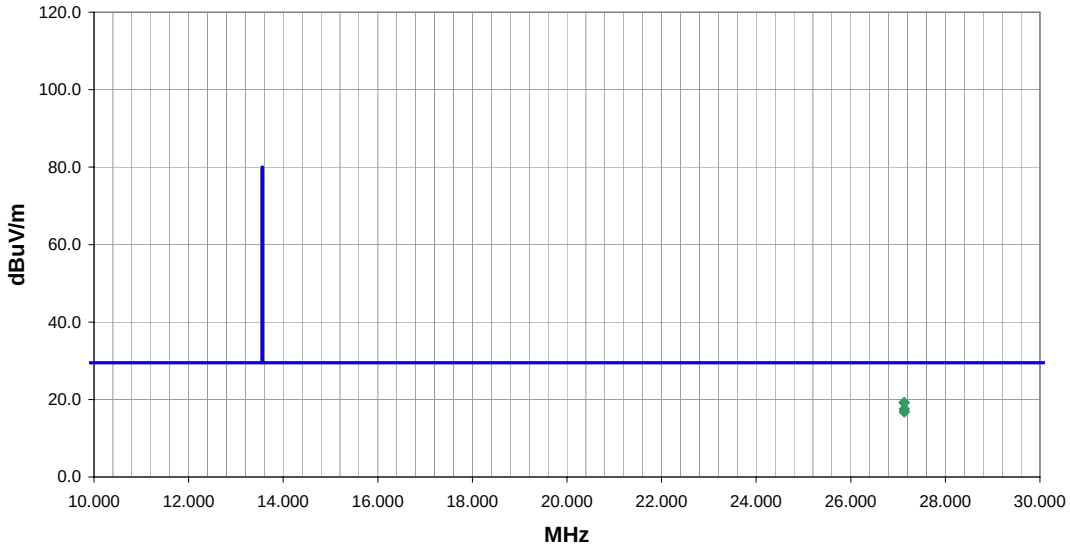
No deviations.

RESULTS

Run #	13
Pass	

Other


Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
27.129	14.1	9.6	238.0	4.0	3.0	0.0 oop/Active I	QP	QP	4.5	19.2	29.5	-10.3	Loop Par to EUT; Perp to GND. 3m
27.133	19.4	9.6	257.0	1.5	3.0	0.0 oop/Active I	QP	QP	12.2	16.8	29.5	-12.7	Loop Perp to EUT; Perp to GND. 3m
27.133	18.7	9.6	207.0	4.0	3.0	0.0 oop/Active I	QP	QP	10.8	17.5	29.5	-12.0	Loop Perp to EUT; Par to GND. 3m
27.130	16.7	9.6	276.0	1.3	5.0	0.0 oop/Active I	QP	QP	9.5	16.8	29.5	-12.7	Loop Perp to EUT; Perp to GND. 5m
27.133	16.3	9.6	267.0	4.0	5.0	0.0 oop/Active I	QP	QP	8.4	17.5	29.5	-12.0	Loop Perp to EUT; Par to GND. 5m
27.133	13.1	9.6	223.0	4.0	5.0	0.0 oop/Active I	QP	QP	3.5	19.2	29.5	-10.3	Loop Par to EUT; Perp to GND. 5m

Distance Adjustment Factor for Radiated Emissions below 30 MHz

Method: Per 47 CFR 15.31(f)(2), the data was extrapolated based upon a the measured fall-off (at each frequency / polarity).

EUT: MA220E

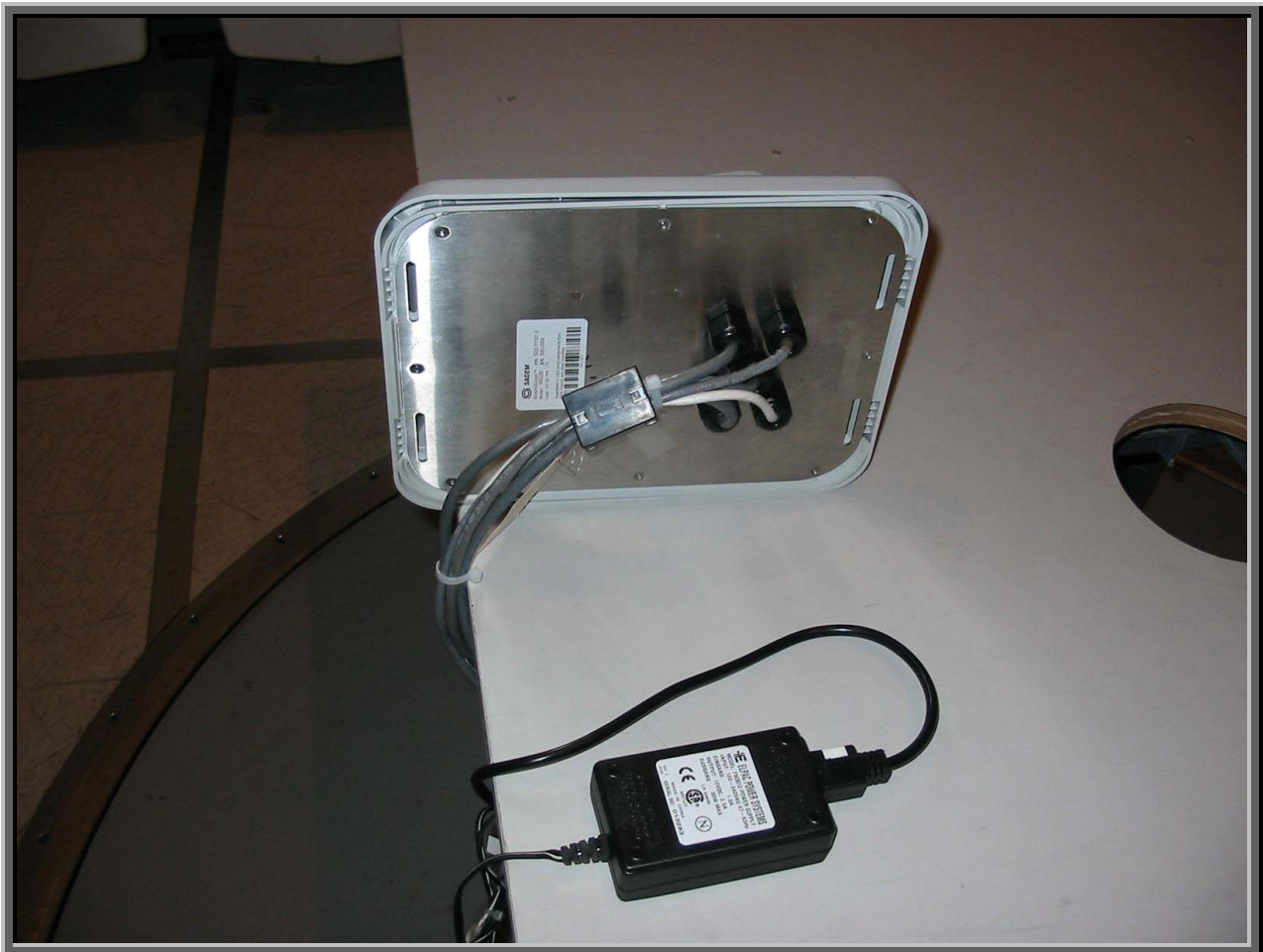
S/N:

Date: 7/18/2003

Job Number: PLEX0348

Frequency (MHz)	Loop Antenna Polarity	Test Distance (meters)	Adjusted Level (dBuV/m)	Fall-Off from 3 to 5 m (dB)	Extrapolation Factor for Specification Limit (dB / decade)	Test Distance of Spec. Limit (meters)	Distance Adjustment Factor (dB)
27.130	Par/Gnd, Perp/EUT	3	28.3	2.4	10.8	30.0	10.8
27.130	Par/Gnd, Perp/EUT	5	25.9				8.4
27.130	Perp/Gnd, Perp/EUT	3	29.0	2.7	12.2	30.0	12.2
27.130	Perp/Gnd, Perp/EUT	5	26.3				9.5
27.130	Perp/Gnd, Par/EUT	3	23.7	1.0	4.5	30.0	4.5
27.130	Perp/Gnd, Par/EUT	5	22.7				3.5





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Single

Operating Modes Investigated:

Typical

Antennas Investigated:

Integral

Data Rates Investigated:

Typical

Output Power Setting(s) Investigated:

Typical

Power Input Settings Investigated:

120 VAC, 60 Hz.

Software\Firmware Applied During Test

Exercise software	Morpho Access	Version	Unknown
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Description

The system was tested using standard operating modes, which do not require software.

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Sagem	MA220E	SMU-0004
Power Adapter 1	Elpac Power Systems	FW3012	013283
Ferrite (on all cables)	N/A	0444173551	N/A

Remote Equipment

Description	Manufacturer	Model/Part Number	Serial Number
Remote laptop	Dell	PPX	N/A
USB Adapter	B&B Electronics	USTL4	N/A
Wiegand to Comm Adapter	N/A	N/A	N/A
Power Adapter 2	Dell	AA20031	0009364U

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Serial	No	0.5	Yes	EUT	Unterminated
DC Leads	PA	1.7	Yes	EUT	Power Adapter 1
AC Power	No	1.6	No	Power Adapter 1	AC Mains
AC Power	No	1.0	No	Power Adapter 2	AC Mains
DC Leads	PA	1.6	Yes	Remote laptop	Power Adapter 2
LAN	No	6.0	Yes	EUT	Remote laptop
Comm	PA	1.7	PA	Remote laptop	Wiegand to Comm Adapter
Keys/Mouse	PA	0.25	PA	Remote laptop/ Key/mouse port	Remote laptop/Comm port
Wiegand	PA	6.0	Yes	EUT	Wiegand to Comm Adapter
USB	Yes	1.3	No	USB Adapter	Remote laptop
Serial	Yes	6.0	Yes	EUT	USB Adapter

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett-Packard	8593E	AAP	10/23/2002	12 mo
Near field probe	EMCO	7405	IPD	No cal required	N/A
AC Power Supply	Hewlett-Packard	6843A	THB	03/06/2003	12 mo
Temperature / Humidity Chamber	Cincinnati Sub- Zero	ZH-32-2-2- H/AC	TBA	9/20/2002	12 mo

Test Description

Requirement: Per 47 CFR 15.255, the frequency stability shall be measured with variation of ambient temperature and primary supply voltage. A spectrum analyzer or frequency counter can be used to measure the frequency stability. If using a spectrum analyzer, it must have a precision frequency reference that exceeds the stability requirement of the transmitter. A temperature / humidity chamber is required.

Configuration:

Variation of Supply Voltage

The primary supply voltage was varied from 85% to 115% of nominal. The EUT can only be operated from the public AC mains, so an AC lab supply was used to vary the supply voltage from 115% to 85% of 120 V, 60 Hz.

Variation of Ambient Temperature

Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range (-20° to +50° C) and at 10°C intervals.

Measurements were made at the single transmit frequency. The antenna is integral to the EUT, so a radiated measurement was made using a spectrum analyzer and a near field probe. The spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

Completed by:



NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT:	MA220E			Work Order:	PLEX0348
Serial Number:	SMU-0004			Date:	07/30/03
Customer:	Plexus			Temperature:	see below
Attendees:	none	Tested by:	Dan Haas	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120VAC /60 Hz	Job Site:	EV09
TEST SPECIFICATIONS					
Specification:	47 CFR 2.1055 & 15.225	Year:	2002	Method:	TIA/EIA - 603
Year:		1993			
SAMPLE CALCULATIONS					
COMMENTS					
EUT OPERATING MODES					
Transmitting					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Minimum frequency stability of +/-0.01% for variations of temperature and supply voltage (AC power)					
RESULTS					
			MINIMUM FREQUENCY STABILITY		
Pass			0.000369%		
SIGNATURE					
Tested By: 					
DESCRIPTION OF TEST					
Frequency Stability					

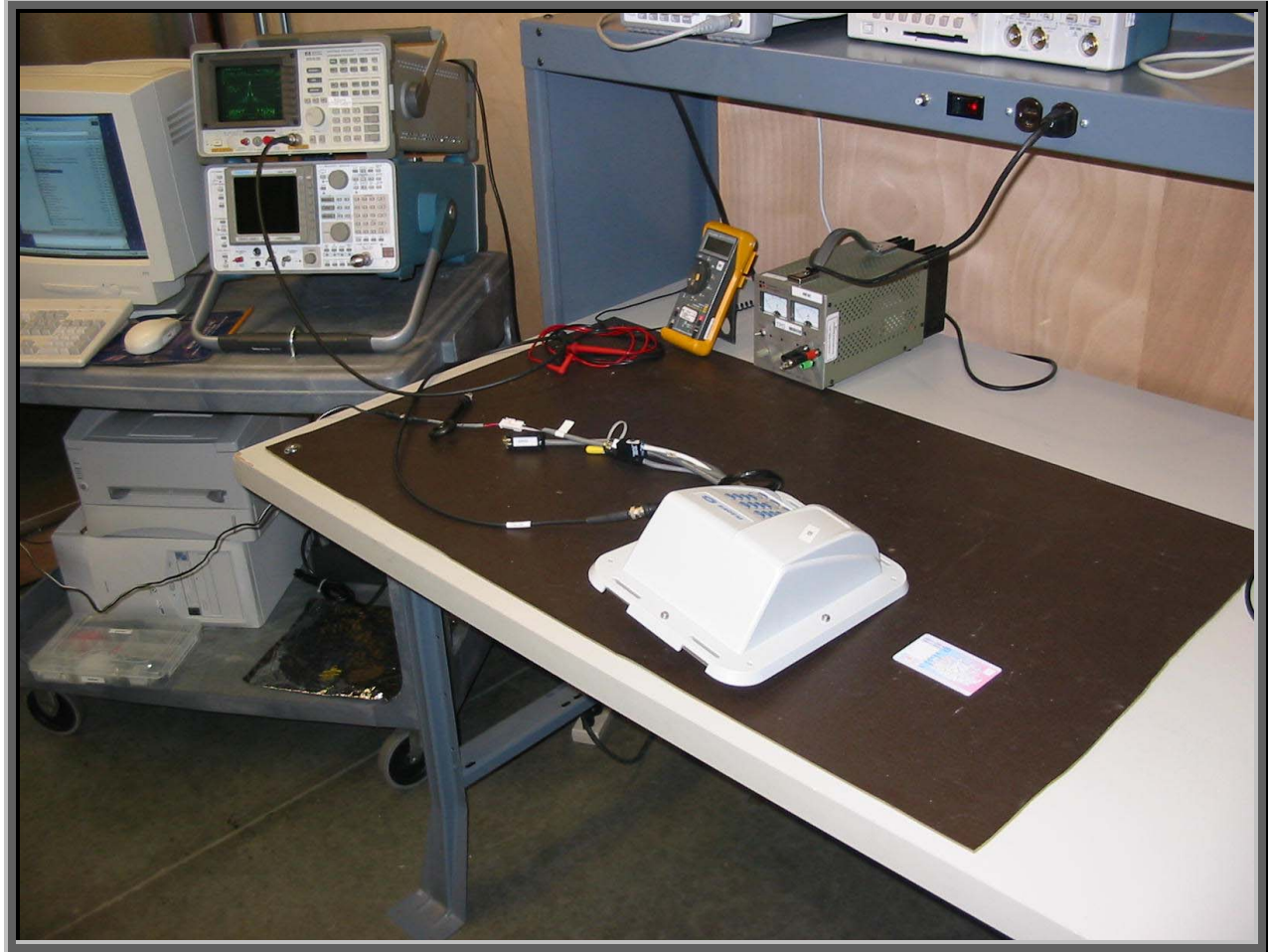
Frequency Stability with Variation of Ambient Temperature (Primary Supply = 120V, 60Hz)

Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (%)	Specification (%)
-20	13.565212	13.565262	0.0003686	+/-0.01
-10	13.565212	13.565249	0.0002728	+/-0.01
0	13.565212	13.565249	0.0002728	+/-0.01
10	13.565212	13.565224	0.0000885	+/-0.01
20	13.565212	13.565212	0.0000000	+/-0.01
30	13.565212	13.565212	0.0000000	+/-0.01
40	13.565212	13.565212	0.0000000	+/-0.01
50	13.565212	13.565225	0.0000958	+/-0.01

Frequency Stability with Variation of Primary Supply Voltage (Ambient Temperature = 25C)

Voltage (VAC, 60Hz)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (%)	Specification (%)
138 (115%)	13.565212	13.565200	-0.0000885	+/-0.01
132 (110%)	13.565212	13.565200	-0.0000885	+/-0.01
126 (105%)	13.565212	13.565212	0.0000000	+/-0.01
120 (100%)	13.565212	13.565212	0.0000000	+/-0.01
114 (95%)	13.565212	13.565212	0.0000000	+/-0.01
108 (90%)	13.565212	13.565212	0.0000000	+/-0.01
102 (85%)	13.565212	13.565212	0.0000000	+/-0.01





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. All of the EUT parameters listed below were investigated. This includes, but may not be limited to, CPU speeds, video resolution settings, operational modes, and input voltages.

Operating Modes Investigated:

Typical operating mode

Power Input Settings Investigated:

120 VAC, 60 Hz

Software\Firmware Applied During Test

Operating system	Morpho Access	Version	Unknown
Description			
The system was tested using standard operating modes, which do not require software.			

EUT and Peripherals in Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Sagem	MA220E	SMU-0004
Power Adapter 1	Elpac Power Systems	FW3012	013283

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Remote laptop	Dell	PPX	N/A
USB Adapter	B&B Electronics	USTL4	N/A
Wiegand to Comm Adapter	N/A	N/A	N/A
Power Adapter 2	Dell	AA20031	0009364U

***Note:** Equipment isolated from the EUT so as not to contribute to the measurement results are considered to be outside the test setup boundary.

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Serial	No	0.5	Yes	EUT	Unterminated
DC Leads	PA	1.7	No	EUT	Power Adapter 1
AC Power	No	1.6	No	Power Adapter 1	AC Mains
AC Power	No	1.0	No	Power Adapter 2	AC Mains
DC Leads	PA	1.6	Yes	Remote laptop	Power Adapter 2
LAN	No	6	No	EUT	Remote laptop
Comm	PA	1.7	PA	Remote laptop	Wiegand to Comm Adapter
Keys/Mouse	PA	0.25	PA	Remote laptop - Key/mouse port	Remote laptop - Comm port
Wiegand	PA	6	No	EUT	Wiegand to Comm Adapter
USB	Yes	1.3	No	USB Adapter	Remote laptop
Serial	Yes	6	No	EUT	USB Adapter

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
LISN	Solar	9252-50-R-24-BNC	LIN	12/12/2002	12 mo
LISN	Solar	9252-50-R-24-BNC	LIP	12/12/2002	12 mo
High Pass Filter	TTE	H97-100k-50-720B	HFC	01/02/2003	12 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	01/07/2003	12 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	01/07/2003	12 mo

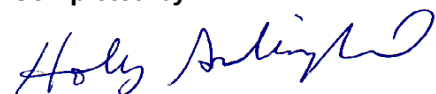
Test Description

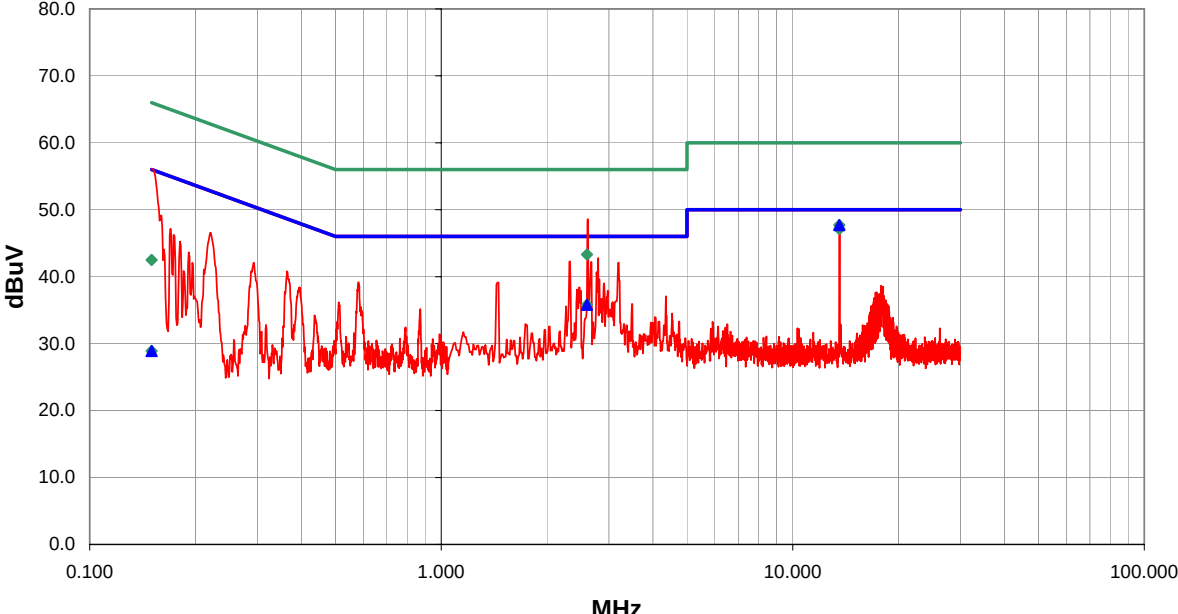
Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50 Ω measuring port is terminated by a 50 Ω EMI meter or a 50 Ω resistive load. All 50 Ω measuring ports of the LISN are terminated by 50 Ω .

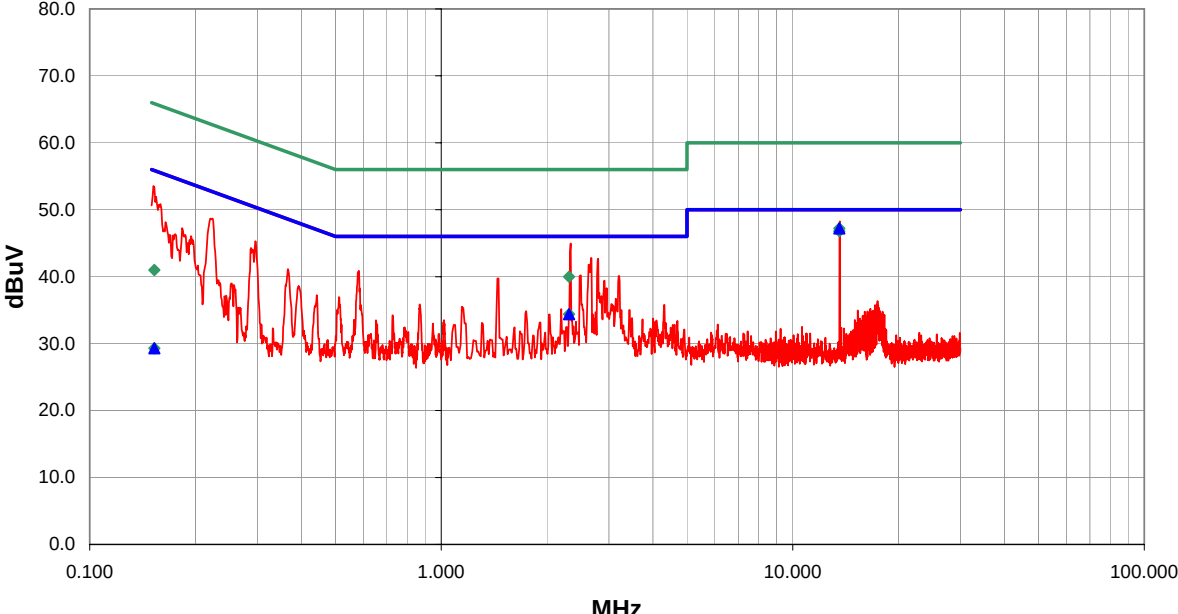
Measurement Bandwidths

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0
<i>Measurements were made using the bandwidths and detectors specified. No video filter was used.</i>			

Completed by:



NORTHWEST EMC		CONDUCTED EMISSIONS DATA SHEET		REV d3.11 06/23/2003					
EUT: MA220E		Work Order: PLEX0348							
Serial Number: SMU-0004		Date: 07/25/03							
Customer: Plexus		Temperature: 75							
Attendees: John Prieve		Humidity: 37%							
Cust. Ref. No.:		Barometric Pressure: 29.99							
Tested by: Dan Haas		Power: 120VAC, 60Hz		Job Site: EV01					
TEST SPECIFICATIONS									
Specification: FCC 15.207		Year: 1997							
Method: CISPR 22		Year: 1997							
SAMPLE CALCULATIONS									
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation									
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator									
COMMENTS									
Serial, Wiegand, Ethernet run to PC. Single turn ferrite on all cables.									
EUT OPERATING MODES									
Scan ready mode									
DEVIATIONS FROM TEST STANDARD									
No deviations.									
RESULTS		Line		Run #					
Pass		L1		4					
Other									
		 Tested By:							
									
Freq (MHz)	Amplitude (dBuV)		Transducer (dB)	Cable (dB)	External Attenuation (dB)	Detector (blank equal peaks [PK] from scan)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
13.564	26.6		0.0	1.1	20.0	AV	47.7	50.0	-2.3
2.599	15.3		0.0	0.5	20.0	AV	35.8	46.0	-10.2
0.150	8.9		0.0	0.0	20.0	AV	28.9	56.0	-27.1
2.599	22.8		0.0	0.5	20.0	QP	43.3	56.0	-12.7
13.567	26.0		0.0	1.1	20.0	QP	47.1	60.0	-12.9
0.150	22.5		0.0	0.0	20.0	QP	42.5	66.0	-23.5
13.596	26.9		0.0	1.1	20.0		48.0	50.0	-2.0
2.796	22.3		0.0	0.5	20.0		42.8	46.0	-3.2
2.326	21.8		0.0	0.5	20.0		42.3	46.0	-3.7
2.676	21.7		0.0	0.5	20.0		42.2	46.0	-3.8
3.196	21.6		0.0	0.5	20.0		42.1	46.0	-3.9
2.766	20.2		0.0	0.5	20.0		40.7	46.0	-5.3
0.221	26.4		0.0	0.2	20.0		46.6	52.8	-6.2
2.816	19.1		0.0	0.5	20.0		39.6	46.0	-6.4
0.581	18.9		0.0	0.3	20.0		39.2	46.0	-6.8
1.455	18.7		0.0	0.4	20.0		39.1	46.0	-6.9
2.906	18.5		0.0	0.5	20.0		39.0	46.0	-7.0
2.476	17.9		0.0	0.5	20.0		38.4	46.0	-7.6
0.170	27.0		0.0	0.1	20.0		47.1	55.0	-7.8
0.364	20.6		0.0	0.2	20.0		40.8	48.6	-7.8

NORTHWEST EMC		CONDUCTED EMISSIONS DATA SHEET		REV d3.11 06/23/2003								
EUT: MA220E		Work Order: PLEX0348										
Serial Number: SMU-0004		Date: 07/25/03										
Customer: Plexus		Temperature: 75										
Attendees: John Prieve		Humidity: 37%										
Cust. Ref. No.:		Barometric Pressure: 29.99										
Tested by: Dan Haas		Power: 120VAC, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: CISPR22 Class B				Year: 1997								
Method: CISPR 22				Year: 1997								
SAMPLE CALCULATIONS												
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation												
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator												
COMMENTS												
Serial, Wiegand, Ethernet run to PC. Single turn ferrite on all cables.												
EUT OPERATING MODES												
Scan ready mode												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS				Line	Run #							
Pass				N	5							
Other												
				 Tested By:								
												
Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
13.564	26.1			0.0	1.1	20.0		AV		47.2	50.0	-2.8
2.310	13.9			0.0	0.5	20.0		AV		34.4	46.0	-11.6
0.153	9.3			0.0	0.0	20.0		AV		29.3	55.9	-26.6
13.564	25.7			0.0	1.1	20.0		QP		46.8	60.0	-13.2
2.310	19.5			0.0	0.5	20.0		QP		40.0	56.0	-16.0
0.153	21.0			0.0	0.0	20.0		QP		41.0	65.9	-24.9
2.336	24.5			0.0	0.5	20.0				45.0	46.0	-1.0
13.608	27.2			0.0	1.1	20.0				48.3	50.0	-1.7
0.152	33.4			0.0	0.1	20.0				53.5	55.9	-2.4
2.676	22.3			0.0	0.5	20.0				42.8	46.0	-3.2
2.796	22.2			0.0	0.5	20.0				42.7	46.0	-3.3
0.224	28.5			0.0	0.2	20.0				48.7	52.7	-4.0
0.296	25.1			0.0	0.2	20.0				45.3	50.4	-5.1
0.583	20.6			0.0	0.3	20.0				40.9	46.0	-5.1
2.496	19.7			0.0	0.5	20.0				40.2	46.0	-5.8
3.206	19.6			0.0	0.5	20.0				40.1	46.0	-5.9
1.455	19.3			0.0	0.4	20.0				39.7	46.0	-6.3
0.288	24.1			0.0	0.2	20.0				44.3	50.6	-6.3
2.916	18.9			0.0	0.5	20.0				39.4	46.0	-6.6
0.183	27.1			0.0	0.2	20.0				47.3	54.3	-7.1

