Attachment 6
TVA Letter Dated March 31, 2011
Responses to Licensee Open Items to be Resolved for SER Approval

TVA Standard Specification SS EI8.14.01, Revision 3, "Electromagnetic Interference (EMI) Testing Requirements For Electronic Devices," dated June 29, 1995

QA Record W06 950630 800

TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING

STANDARD SPECIFICATION

SS E18.14.01

ALL NUCLEAR PROJECTS

ELECTROMAGNETIC INTERFERENCE (EMI) TESTING
REQUIREMENTS FOR ELECTRONIC DEVICES

0405721056
CHAT NE SS-E
SS-E18.14.01
062995 3

	REVISION 0	R1	R2	R3
ISSUE DATE	12/1/82	8/18/86	1/9/95	6-29-95
PREPARED	M. L. Duncan	M. L. Duncan	R. L. Brehm	R. L. Brehm
CHECKED	M. C. Brickey	D. L. Reed	R. R. Reeves	E. J. Bradley
REVIEWED	A. F. Pagano	M. C. Brickey for A. F. Pagano	E. J. Bradley	E. J. Bradley
APPROVED	F. W. Chandler	W. S. Raughley	J. K. Greene for R. C. Williams	R. C. Williams

Title: ELECTROMAGNETIC INTERFERENCE (EMI) TESTING REQUIREMENTS FOR ELECTRONIC DEVICES		**REVISION LOG** SS E18.14.01
Revision No.	**DESCRIPTION OF REVISION**	Date Approved
1	Replaced cover sheet with revised sheet reflecting organizational change from "Division of Nuclear Engineering Design" to "Division of Nuclear Engineering" Revised Figure 9.5.b to correct editorial error in units.	8-15-86
2	Revised to correct Figure 9.5.b error in vertical axis units	1-9-95
3	Revised in entirety to conform to the test methods endorsed by EPRI in report TR-102323. Requirements for the Engineer and Vendor are clarified and expanded. The revision date is the effective implementation date. There are no backfit requirements.	6-29-95

TABLE OF CONTENTS

1.0 SCOPE

1.1 This specification contains the test requirements for all analog and digital electronic equipment to ensure that the equipment will maintain all functional characteristics as required by other TVA specifications when subjected to electromagnetic excitations typical of power plants. These tests comply with recommendations of the Electric Power Research Institute given in reference 2.11.

1.2 This specification also includes test requirements to ensure that extraneous electromagnetic emissions from the electronic equipment under test are kept below defined levels to ensure electromagnetic compatibility with existing electronic equipment located within the plant.

1.3 This specification identifies required test levels and applicable standards for actual implementation of the EMI tests. The individual standards may differ on specific procedures, levels, and wave shapes or frequency bands: however, this specification has selected conservative levels such that application of any of the referenced standards will result in acceptable performance of the device/system.

1.4 The responsibilities and requirements of the Engineer and the Vendor are detailed. The specific requirements are in sections throughout the document. In general, the Engineer defines the required tests, the required device/system functions, the acceptance criteria for the device/system, and approves the test procedure and results. The Vendor supplies the equipment, performs the test, makes necessary corrections to the device/system as required, and submits the test procedure and results for approval.

1.5 **Defining Required Tests** All sections of this specification apply to analog and digital electronic equipment that meet at least one of the following conditions:

1.5.1 Class 1E.

1.5.2 Post Accident Monitoring (PAM) category 1 and 2 for all type A, B, C, D and E variables.

1.5.3 Equipment relied upon by the operations staff to initiate or monitor an Emergency Operating Procedure (EOP).

1.5.4 Equipment that can initiate a plant trip or operational transient due to misoperation or failure to operate.

1.5.5 Equipment under the augmented Quality Assurance program if required by the program manager.

1.6 All other electronic equipment not covered by section 1.5 must meet the emissions requirements in sections 8.6, 8.7.

2.0 REFERENCED DOCUMENTS

The following standards, including those specified elsewhere in this specification as applicable, form a part of this specification.

2.1 PMC33.1-1978, Electromagnetic Susceptibility of Process Control Instrumentation, Scientific Apparatus Makers Association (SAMA), Process Measurement Control, Inc. (PMC).

2.2 International Electrotechnical Commission (IEC) Standard 801, Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment.

2.2.1 Part 2, 1991, Electrostatic discharge requirements.

2.2.2 Part 3, 1991, Radiated electromagnetic field requirements.

2.2.3 Part 4, 1991, Electrical fast transient/burst requirements.

2.2.4 Part 5, 1991, DRAFT, Surge immunity requirements.

2.2.5 Part 6, 1992, DRAFT, Immunity to conducted disturbances induced by radio frequency fields above 9 kHz.

2.3 ANSI/IEEE C62.45-1991, Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits.

2.4 ANSI/IEEE C63.12-1987, Electromagnetic Compatibility Limits-Recommended Practice

2.5 ANSI/IEEE C62.41-1991, Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits.

2.6 ANSI/IEEE C63.16-1993, Guide for Electrostatic Discharge Test Methodologies and Criteria for Electronic Equipment.

2.7 MIL-STD-461C, Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference, 4 August 1986.

2.8 MIL-STD-461A NOTICE 4 (EL) figure 16

2.9 MIL-STD-461D, Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference, January 1993.

2.10 MIL-STD-462D, Electromagnetic Interference Characteristics Measurement, January 1993.

2.11 EPRI TR-102323 Final Report September 1994, Guidelines for Electromagnetic Interference Testing in Power Plants

2.12 Telecommunications. Code of Federal Regulations (CFR) 47. Part 15. Revision October 1. 1993.

3.0 ENGINEER RESPONSIBILITIES AND REQUIREMENTS

3.1 Define Device/System Requirements The Engineer shall define test configuration and monitoring including all the input, output, storage and display parameters for the device/system that are required for proper performance.

3.2 Define Acceptance Criteria for Test The Engineer shall define the acceptance criteria for the device/system. It shall be based on knowledge of the function of the equipment and the acceptability of deviations from specified performance. This is a joint process between the Engineer and the Vendor. (Example: The device's analog output shall not deviate more than 1% of the ideal output during and after the test.)

3.3 Define Interfaces with Existing Plant Equipment.

3.3.1 The Engineer shall define wiring type(s), connection methods and any conduits that will be connected to the device/system.

3.3.2 The Engineer shall define the grounding scheme for the device/system. Large spacial distances (>100 ft) or multiple power sources used in the loop for a device or for multiple devices in a system shall be part of the grounding scheme definition.

3.4 Determine Required Tests The Engineer shall determine the required tests per the criteria given in sections 1.5, 1.6.

3.5 Approval of Experience or Alternate Test Methods

3.5.1 Experience The Engineer or the Vendor may use operating experience to waive all or specific tests. This wavier is to be written and approved in by the Corporate EMI Specialist or his Designate.

3.5.2 Alternate Test Methods The Engineer may approve Vendor submitted alternate tests. Approval is only by the Corporate EMI Specialist or his Designate

4.0 VENDOR RESPONSIBILITIES AND REQUIREMENTS

4.1 Submit a Test Procedure for Approval by the Engineer

4.1.1 All test procedures shall be submitted to the Engineer for approval with sufficient time prior to the test for comment resolution. Submittal of the test procedure shall not be less than two weeks prior to the test.

4.1.2 A functional block diagram shall be included in the test procedure. This diagram shall include all wiring connections and identify test point locations.

4.1.3 Devices/system shall be configured as close as practical to the installed configuration.

4.1.4 Acceptance criteria shall be included in the test procedure.

4.2 Ensure that at least one of every component of the defined system/device is included in the test.

4.3 Ensure that all required functions of the system/device are exercised during the test.

4.3.1 Test procedures shall include steps that stimulate and verify the required functional characteristic of the device or system as defined in the system requirements. This selection of the functional characteristics to be tested is a joint process between TVA or its contractor and the vendor. Methods and any additional test equipment used for verification of proper system performance shall be included in the test procedure.

4.4 Provide materials for all modifications required to the system/device so that the device/system will comply with the acceptance criteria. (Note: It is recommended that sufficient troubleshooting/correction time be included in the contract with the test laboratory.)

4.5 Submit test results for approval by the Engineer.

4.6 Submit alternate tests or justifications for approval by the Engineer.

4.6.1 In lieu of the test procedures described herein (or portions thereof) and **subject to prior approval by TVA**, the Vendor may substitute his standard EMI test.

4.6.2 **A complete test report shall be submitted to the Engineer for approval.**

4.6.3 In lieu of testing, an equipment experience justification may be substituted. **A complete justification report shall be submitted to the Engineer for approval.**

4.6.4 Failure of the Vendor's test report or justification to receive approval by the Engineer shall **not** relieve the Vendor of his responsibility to perform the test in accordance with this specification.

4.7 Provide knowledgeable personnel, as required, at the test location to oversee/perform testing.

5.0 DEFINITIONS

5.1 The Engineer The Engineer shall be defined as the Technical Engineer as defined in the special conditions of this invitation to bid.

5.2 Device. A device shall be defined as a component or group of components housed in a single enclosure.

5.3 Interconnecting Cable. An interconnecting cable shall be defined as a cable which connects between devices or components.

5.4 System. A system is a group of devices in multiple enclosures or multiple components that work together for a prescribed function.

6.0 TYPES OF TESTS

The test types are defined in accordance with the EPRI report of reference 2.11.

6.1 Radiated Susceptibility - Continuous - High Frequency.

6.2 Conducted Susceptibility - Continuous - Low Frequency.

6.3 Conducted Susceptibility - Continuous - High Frequency.

6.4 Surges - Transient - High Energy - Infrequent.

6.5 Impulses & Bursts of Impulses - Transient - Low Energy - Infrequent.

6.6 Electrostatic Discharge Susceptibility - Transient - Infrequent.

6.7 Radiated Emissions.

6.8 Conducted Emissions.

7.0 TEST PROCEDURES (GENERAL)

7.1 Preference is given to the test procedures described in reference 2.2. When new tests are performed it is recommended that this series of tests be chosen.

7.2 The following is a general recommended procedure for performing any or all of the tests which are identified in section 6. Details will vary depending upon the device under test and the particular EMI excitation technique which is being employed.

7.2.1 Connect the device/system to be tested and the EMI equipment in accordance with the approved test procedure.

7.2.2 After energizing and operating the device/system and applying the approved input signal(s) to the device/system under test, verify that the selected type of EMI excitation signal meets the frequency and amplitude specifications of the approved test procedure and make adjustments as may be required.

7.2.3 Observe the response of the device/system under test while applying the EMI signal and whenever it is susceptible to the EMI, record the frequency, type of EMI excitation, and determine the susceptibility threshold level that just initiates the out-of-specification response. The duration over which the EMI signal is applied should be long enough to allow for the response time of the device under test.

7.3 Repeat the steps of subsections 7.2 over the frequency range of the particular EMI excitation signal being employed.

7.4 Inadvertent Ground Loops / Coupling

7.4.1 Devices may inadvertently introduce ground loops to a system. Even when the device meets the acceptance criteria, if the signal input/output shows a marked increase in noise during power line tests, measures shall be taken to minimize/eliminate this noise coupling.

8.0 TEST PROCEDURES (SPECIFIC)

8.1 Radiated Susceptibility

8.1.1 Purpose. The purpose of this test is to verify that the device/system is not susceptible to radiated electromagnetic signals. Radiated signals are generated by a radiating antenna element, either intentional or inadvertent, which in turn is driven by a signal generator. Typical intentional radiating sources within the plant are: portable tansclevers, perimeter security systems, cellular telephones, and microwave relays. Typical inadvertent radiating sources are: arc welders, public address systems, switching mode power supplies, digital data transfer lines, motor/generator brush assemblies, arcing across poor connections in a power bus of ground system, switching devices such as silicon-controlled rectifiers (SCRs) and surge arrestors, and signal generators in measurement and control systems.

8.1.2 Test Configuration. For the required test configuration see the selected standard.

8.1.2.1 Devices or systems mounted in cabinets shall be tested with the door(s) open.

8.1.3 Excitation.

8.1.3.1 Frequency 10 kHz to 1 Ghz

The lower frequency limit may be increased to 20 MHZ if the it can be demonstrated that the device/system will be installed in an area where intervening metallic structures will be close enough to the device/system to limit the lower frequencies to the inductive field region. (The critical distance is 2.4 meters. See reference 4 section 3.1.1.)

8.1.3.2 Amplitude 10 volt rms per meter

(NOTE: This amplitude is contingent on meeting the requirement in reference 4 of a 1 meter separation from hand held transceivers. If this separation distance cannot be met then the Engineer shall define the amplitude requirement.)

8.1.3.3 Modulation Frequency 1 kHz

8.1.3.4 Modulation Percent >80%

8.1.3.5 Modulation Waveform Amplitude modulated, 50% duty cycle

8.1.3.6 Sweep Rate Vary frequency by sweeping from lower limit to 1 Ghz at approximately 1.5×10^{-3} decades per second.

8.1.4 Acceptance Criteria Device/system performance shall be considered acceptable if it meets the approved acceptance criteria in the test procedure. In general the device is considered acceptable if no malfunction, undesired response, degradation of performance, or permanent damage to the device occurs when subjected to the excitations required by this test.

8.1.5 Alternate Tests The following tests have acceptable test procedures. It is recommended that the exitation defined above be used. Use of the selected standard exitation is subject to the aproval by the Engineer.

8.1.5.1 Reference 2.7, Test RS-03, Class A3

8.1.5.2 Reference 2.9, Test RS103

8.1.5.3 Reference 2.2.2

8.1.5.4 Reference 2.1

8.2 Conducted Susceptibility

8.2.1 Purpose The purpose of this test is to verify that the device/system is not susceptible to conducted electromagnetic signals. Conducted continuous wave signals, observed as voltage of currents on conductors/cables, will range form 60 Hz power signals up to microwave communication frequencies.

At lower frequencies, 10 kHz and below, they will typically be due to lighting and power distribution equipment such as switching mode power supplies and SCR based voltage controls.

At higher frequencies, above 10 kHz, the continuous wave signals will be due to the pick up of radiated signals, possibly at the extremities of interconnecting cable to the device/system.

8.2.2 Test Configuration For the required test configuration see the selected standard.

8.2.3 Excitation

8.2.3.1 Low Frequency - Power Conductors Only

8.2.3.1.1 Frequency 30 Hz to 50 kHz

8.2.3.1.2 Amplitude 6.3 Vrms average

Voltage is specified for standard employing a capacitive coupling device. When selected standard employs a current clamp, use current limits equivalent to voltage levels assuming a 50 ohm nominal impedance.

8.2.3.1.3 Alternate Tests The following tests have acceptable test procedures. It is recommended that the exitation defined above be used. Use of the selected standard exitation is subject to the aproval by the Engineer.

8.2.3.1.3.1 Reference 2.7, Tests CS-01, CS-02, and RS-02 Part II Class A3

8.2.3.1.3.2 Reference 2.9, Test CS-101

8.2.3.2 High Frequency - All cables or bundles of cables including power cables

8.2.3.2.1 Frequency 50 kHz to 400 MHz

8.2.3.2.2 Amplitude 7 Vrms

8.2.3.2.3 Modulation Frequency 1 kHz

8.2.3.2.4 Modulation Percent >80%

8.2.3.2.5 Modulation Waveform Square Wave, 50% duty cycle

8.2.3.2.6 Alternate Tests The following tests have acceptable test procedures. It is recommended that the exitation defined above be used. Use of the selected standard exitation is subject to the aproval by the Engineer.

8.2.3.2.6.1 Reference 2.9, Test CS-114

8.2.3.2.6.2 Reference 2.2.5

8.2.3.3 Apparent power to the device/system under test is not to exceed the level specified in the selected standard.

8.2.3.4 The signal injection/coupling technique is per the selected standard.

8.2.4 Acceptance Criteria. Device performance shall be considered acceptable if it meets the approved acceptance criteria in the test procedure. In general the device is considered acceptable if no malfunction, undesired response, degradation of performance, or permanent damage to the device occurs when subjected to the excitations required by the selected test.

8.3 Surge Susceptibility

8.3.1 Purpose The purpose of this test is to verify that the device is not susceptible to high energy transient surges. Surges are considered to be relatively high energy, unidirectional pulses caused by lightning, load switching, and line faults. Surges are generally encountered on the AC or DC power leads, on power grounds, and on conductors/cables that have no enveloping metallic shield or on conductors that connect between separate ground mats. Exposed power mains will be the main source of lightning caused surges. Lightning does not have to strike the power line or ground system directly to create a surge. The sudden return to earth of an induced charge, caused by elimination of the inducing charge, can cause significant surges in these systems.

8.3.2 Test Configuration For the required test configuration refer to the selected test.

8.3.3 Excitation Apply to power lines and outer conductors/shields of all cables that connect to external structures or facilities unless cables are run in a continuous conduit and the ground system is common between both ends of the cable. Apply between power conductors and between conductors and ground.

8.3.3.1 Wave shape Open Circuit, 0.5 μs rise time, 10 μs (at the 50% amplitude) pulse width, double exponential

(Note: This is a modified wave shape of reference 2.2.4 as determined in reference 2.11.)

8.3.3.2 Amplitude 3 kV

(This value may be varied based on the guidance in reference 2.2.4 subject to approval by the Engineer.)

8.3.3.3 Repetition Allow 30 to 120 seconds between surges

8.3.4 Acceptance Criteria Device performance shall be considered acceptable if it meets the approved acceptance criteria in the test procedure. **The Engineer** shall define the required Surge Withstand Capability (SWC) Classification for the device/system.

Surge Withstand Capability (SWC) Classification The functional requirements of devices during and after application of surge excitations shall be identified by the SWC classification as defined below. Devices meeting the requirements of section 1.5 shall be SWC Class C. Devices or systems meeting the requirements of sections 1.5.4, 1.5.5 can be less than SWC Class C provided any malfunction or erroneous output due to the surge does not cause a plant trip.

8.3.4.1 SWC Class A Devices designated as SWC class A shall be protected from permanent damage following the application of the surge excitations by a sacrificial device (fuse, fusible link, circuit breaker, etc.). The adequacy of the sacrificial device in preventing permanent damage shall be verified during testing. Restoration of device operation following surge application shall require as a maximum (a) replacement of the sacrificial device and (b) initiation of device restart sequence.

8.3.4.2 SWC Class B Devices designated as SWC class B shall not incur any permanent damage from the application of surge excitations. Restoration of device operation following application of the above excitation shall not require any component replacement and shall require, as a maximum, the manual initiation of the device restart procedure. Also in the case of the transmission of data (both digital and analog, as applicable) verification of the validity of data which is transmitted during, surge excitation application is not required; however, the ability of the device to transmit and receive (as applicable) accurate data following the end of the surge excitation and device restart shall be demonstrated.

8.3.4.3 SWC Class C Devices designated as SWC class C shall not cease operation due to the application of surge excitations. In the case of the transmission of data (both digital and analog, as applicable), continued operation of the device both during and after the surge application shall not result in erroneous control actions or sustained errors in information display.

8.3.5 Alternate Tests The following tests have acceptable test procedures. It is recommended that the exitation defined above be used. Use of the selected standard exitation is subject to the aproval by the Engineer.

8.3.5.1 Reference 2.7 , Test CS-06

8.3.5.2 Reference 2.9, Test CS-116

8.3.5.3 Reference 2.2.4

8.3.5.4 Reference 2.3

8.4 Impulse and Burst of Impulses Susceptibility

8.4.1 Purpose The purpose of this test is to verify that the device is not susceptible to impulses. Impulses are a low energy equivalent of the surge. They are caused by nearby switching on short power distribution lines, where the actual energy stored in either the capacitance or inductance of the line and load is much less than a long power distribution line. In addition to being lower energy, the rise time of the pulse is much faster. The amplitudes may be much higher than a surge, but these are quickly damped out due to the losses in the lines. Arcing during switching will generally produce a burst of these pulses rather than just a single impulse. Unsuppressed relays or coils are the greatest cause of these transients. These transients will readily couple to other lines. These transients can be generated even on 5 volt logic lines.

8.4.2 Test Configuration For the required test configuration see the selected test.

8.4.3 Excitation

8.4.3.1 Wave shape 3 ηs rise time, with a minimum of 50 and a maximum of 500 ηs width at 50% peak, double exponential
(Note: This is a modified wave shape of reference 2.2.4 as determined in reference 2.11.)

8.4.3.2 Amplitude (This value may be varied based on the guidance in reference 2.2.3 subject to approval by the Engineer.)

8.4.3.2.1 Power lines	Bulk Current	60 A into a 50Ω load
	Voltage	3 kV into a 50Ω load

8.4.3.2.2 Data/Control lines	Bulk Current	40 A into a 50Ω load
	Voltage	2 kV into a 50Ω load

8.4.4 Acceptance Criteria. Device performance shall be considered acceptable if it meets the approved acceptance criteria in the test procedure. In general the device is considered acceptable if no malfunction, undesired response, degradation of performance, or permanent damage to the device occurs when subjected to the excitations required by the selected test.

8.4.5 Alternate Tests The following tests have acceptable test procedures. It is recommended that the exitation defined above be used. Use of the selected standard exitation is subject to the aproval by the Engineer.

8.4.5.1 Reference 2.7, Test CS-06

8.4.5.2 Reference 2.9, Test CS-115

8.4.5.3 Reference 2.2.3

8.5 Electrostatic Discharge Susceptibility (ESD)

8.5.1 Purpose. The purpose of this test is to verify that the device is not susceptible to ESD. ESD is the sudden transfer of charge between two bodies at differing electrostatic potential. The electrostatic potential may be created by an induced charge on a conductor or by bound charge on an insulator. The sudden transfer of charge may result in a spark. The ESD may be directly to the device/system or to nearby equipment or structures. The discharge voltage may be as high as 15 kV and of very short duration (less than 50 ηs). An ESD event will produce electric field variations and magnetic field variations. The magnetic field variations will readily cause EMI to be induced into conductor loops inside the device/system or cables near the discharge. The initiation of an ESD event is most likely to be caused by the man-machine interface.

8.5.2 Test Configuration For the required test configuration see the selected test. Test points should be selected on the basis of accessibility during operation. For example, front panels, keyboards, etc., can all be touched during operation and should be tested extensively. Side or back panels may not be exposed during operation and need not be tested directly. However, the cables entering the rear or sides should be tested at the entry point. The highest probability of interference will be at the points where wire bundles or loops are close to the point of discharge.

8.5.3 Excitation Devices meeting the requirements of section 1.5 shall be tested to a minimum level of reference 2.2.1 class 3. Relaxation of this classification testing is allowed based on the criteria of reference 2.2.1 subject to the approval of the Engineer.

8.5.4 Acceptance Criteria. Device performance shall be considered acceptable if it meets the approved acceptance criteria in the test procedure. In general the device is considered acceptable if no malfunction, undesired response, degradation of performance, or permanent damage to the device occurs when subjected to the excitations of the selected test.

8.5.5 Alternate Tests The following tests have acceptable test procedures. It is recommended that the exitation defined above be used. Use of the selected standard exitation is subject to the aproval by the Engineer.

8.5.5.1 Reference 2.2.1

8.5.5.2 Reference 2.6

8.6 Radiated Emissions

8.6.1 Purpose The purpose of this test is to verify that the device or system does not radiate electromagnetic emissions to the environment is excess of the limits.

8.6.2 Test Configuration For the required test configuration see the selected test.

8.6.3 Excitation No test equipment excitation is required. However, the device/system under test shall be operable. If the device/system has components such as relays, disk drives, etc., they shall be operated during the test.

8.6.4 Acceptance Criteria The device performance shall be considered acceptable if the electromagnetic emissions do not exceed the values determined by reference 2.11, Figure 7.4. The required frequency range is 1 MHz to 1 Ghz.

8.6.5 Alternate Tests The following are acceptable alternate tests for radiated emissions.

8.6.5.1 Reference 2.9, Test RE-102

8.6.5.2 Reference 2.12

8.7 Conducted Emissions

8.7.1 Purpose The purpose of this test is to verify that the device does not generate electromagnetic emission on the power leads. (Note: While this is a power line test, some devices have outputs that control power such as switching power supplies, pulse control to valves, etc., these devices outputs must meet the requirements of this test. **The Engineer** shall require this test for these types of devices.)

8.7.2 Test Configuration For the required test configuration see the selected test.

8.7.3 Excitation No test equipment excitation is required. However, the device/system under test shall be operable. If the device/system has components such as relays, disk drives, etc., they shall be operated during the test.

8.7.4 Acceptance Criteria The device performance shall be considered acceptable if the electromagnetic emission on the power leads shall not exceed the values defined in reference 2.11, Figure 7-2. The required frequency range is 10 kHz to 400 MHZ.

8.7.5 Alternate Tests The following are acceptable alternate tests for conducted emissions.

8.7.5.1 Reference 2.7 , Test CE-03 Figure 4.4 Curve 2.

8.7.5.2 Reference 2.9, Test CE-102 Figure CE102-1.

8.7.5.3 Reference 2.12

9.0 DOCUMENTATION

The Vendor shall submit a complete test report documenting the following as a minimum:

9.1 Description of test equipment including manufacturer and model number and complete test configuration description.

9.2 Details of any anomalies encountered during testing.

9.3 Details of any modifications to the device/system or special installation procedures required for proper operation of the device/system. Note: Any additional equipment or device/system modifications required to satisfy the requirements of this specification shall be the responsibility of the Vendor.