Taking the Laboratory to the Customer Site

ERIC A. GEORGE
Ergonomics, Inc.

INTRODUCTION

It has been three years since the introduction of Test Methods for Visual Display Units MPR 1990:8, 12-01, commonly referred to as MPR2. Widespread testing and refinement of video display electromagnetic field (EMF) emissions characteristics has led to the ready availability of MPR2-compliant monitors. This may go a long way toward supplying future customers with low emission alternatives but does little to address the dilemma facing companies with computer equipment predating 1990. Corporations are becoming increasingly concerned with non-ionizing radiation and potential health effects. This is true of manufacturers as well as service-oriented firms and has resulted in the strategy of prudent avoidance.

Prudent avoidance supports the view that until more is known about the effects of magnetic and electric fields on the human organism, exposure to EMFs should be limited, especially in settings where reduction of fields can be accomplished at minimal cost and effort. EMF mitigation in the workplace can be achieved through the repositioning of existing equipment and the purchase of electronics which have been proactively designed to reduce emission levels. Few firms, however, are willing to dispose of existing monitors and to replace them with MPR2-compliant units. Replacement of older monitors is more likely to be through attrition.

Many businesses are taking the step of evaluating the workplace environment (including VDTs) either by in-house industrial hygienists or by outside engineering consulting firms. The latter choice has its advantages since corporate bias is less of an issue to the labor force. The MPR2 test method enables the evaluation and retrofitting of video display terminals at the customer site, providing a cost-effective alternative to the traditional off-site testing of monitors.

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MPR2 TESTING AND EMISSIONS GUIDELINES

The complete emissions section for MPR2 covers magnetic, electric, electrostatic, and x-ray. X-ray is no longer an issue since this is such an easily controlled problem. Electrostatics, even though they are important and are being studied, have never been subjected to the same level of scrutiny as magnetic and electric fields. This article will review ELF and VLF magnetic and electric field testing to the MPR2 test method. MPR2 emission guidelines may be found in Table 1.

BACKGROUND

MAGNETIC FIELD MEASUREMENTS

In a cathode ray tube VDT, magnetic fields originate from deflection coils, the power supply, the high voltage transformer, and circuitry. Magnetic fields are measured in Tesla (T) and are representative of the true root mean square (rms) value of the amplitude of the magnetic flux density vector. Band 1 covers the frequency range of 5 Hz to 2 kHz, while Band 2 is restricted to 2 kHz to 400 kHz.

Prior to testing, ambient measurements must be taken and may not exceed 40 nT and 5 nT for Bands 1 and 2 respectively. The testing surface is cylindrical. Two three-axis coil meters are required, one for Band 1 and the other for Band 2. Three-axis technology is now being utilized in most laboratory R&D settings to avoid errors related to field direction. Thus the operator need not be concerned with antenna orientation.

The procedure begins with 16 measurements taken at 22.5 degree increments, with the meter being lowered 30 cm for another 16 points of measurement. The process is repeated at 30 cm above the center line for a total of 48 points of measurement. When readings are less than 200 nT in Band 1 and less than 10 nT in Band 2, results are reported as <200 nT and <10 nT respectively.

ALTERNATING ELECTRIC FIELD MEASUREMENTS

MPR2 addresses time variable electric fields, fields in the frequency range of 50 Hz to 2 kHz. The source can be traced to the power supply and vertical refresh units of the VDT. The other frequency range covered is 15 kHz to 80 kHz, originating in the horizontal deflection unit of the VDT and the switch-mode power

supplies. Measurement results are presented in V/m and are equivalent to the rms value of the electric field strength at the measuring probe. The probe consists of a double-sided printed circuit board laminate disk measuring 300 mm in diameter. ELF alternating electric fields are taken at 0.5 meters distance from the front of the VDT, while VLF readings are taken in the front, at the sides and at the back of the monitor. All measurements are considered valid if they fall within the following ranges: Band 1: 10 V/m to 1000 V/m and Band 2: 1 V/m to 100 V/m.

To learn more about MPR2 certification and laboratory requirements, SWEDAC can be contacted directly.*

ON-SITE CUSTOMER TESTING OF MONITORS VERSUS LABORATORY TESTING

Whether testing in the laboratory or at the customer site, the engineering considerations are the same. The question here is not which would be preferable from an engineering standpoint. Clearly, the lab would be the first choice, since conditions are more easily controlled.

Field testing has several benefits from an economic and practical viewpoint. Savings result from the elimination of shipping costs to and from the laboratory and downtime while a monitor is in transit. An additional advantage is direct communication between the company being tested and the testing service.

When testing hundreds, and in some cases thousands, of monitors, time presents the greatest challenge. Without using some form of automated test procedure, the cost in time would be prohibitive. This is true for both laboratory and field testing.

CHARACTERISTICS TO BE TESTED ACCORDING TO MPR 1990:8		GUIDELINES
EMISSION PROPERTIES		
2.01	X-ray Radiation	---
2.02	Electrostatic Potential	±500
2.03	Alternating Electric Field	
	Band II 2 kHz-400 kHz	≤ 2.5 V/m, measured 50 cm around the VDU
	Band I 5 Hz-2 kHz	≤ 25 V/m, measured 50 cm from the VDU
2.04	Magnetic Field	
	Band II 2 kHz-400 kHz	< 25 nT, measured 50 cm around the VDU
	Band I 5 Hz-2 kHz	<250 nT, measured 50 cm around the VDU
2.05	Electrostatic Discharge (Keyboard)	---

***Table 1**. Guidelines Given in MPR 1990:10.*

An automated rig turns the procedure into a mechanical process, reducing the potential for error and increasing speed. Whatever the method, portability, and ease of equipment setup and dismantling are crucial to overcome time restraints. These requirements can be met through the use of a collapsible cart which can be air-transported to consecutive test sites. The cart features a built-in turntable and moveable arms for mounting test instrumentation.

CUSTOMER SITE ENVIRONMENTAL CONSIDERATIONS

As with any test procedure, one major consideration is the control over external factors such as ambient levels. It would be impractical to attempt a correction of every customer site which has ambients far in excess of the MPR2 guidelines. Control of ambients for magnetic field testing to MPR2 is sometimes best accomplished by moving to another location.

RETROFITTING MONITORS

Shielding VDTs is possible using existing engineering techniques. The scope of this solution is dependent upon whether the emissions to be shielded are magnetic or alternating electric fields. The two primary materials to be used are nickel/iron alloy for magnetic shielding and aluminum for electrical. Shielding cost is directly proportional to the amount of materials and the method utilized. An internal shielding solution is ideal, provided that the inner workings of the monitor permit access. This should be done in conjunction with the client's computer service organization to reduce the likelihood of liability since it is necessary to be in close proximity to sensitive components.

Where an internal approach is not feasible, the monitor may be shielded externally. One method is to employ shielding to cover the sides, back and top. After heating the materials, they are attached to the VDT using Velcro® or a similar material. Air vents are provided as needed. One innovative method is to utilize nickel/alloy-lined plastic which may be slipped over the entire VDT. Ample space is usually available for aeration.

Under most circumstances, the same shielding method can be used on the same model VDT with similar results. One caveat is that monitor manufacturers may use several subcontractors to build the internal electronics for the same computer model. As a result,

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*SWEDAC (Swedish Board for Technical Accreditation), Box 878, S-501 15 Boras, Sweden. Telephone: 46-33-17-7700; FAX: 46-33-10-1392.

two VDTs with the same model number may produce differing emission levels. This was the basis for monitor testing and for the development of the mobile test laboratory.

CONCLUSION

Now that MPR2 has become widely accepted among video display manufacturers, the question is not which test method to use or which guidelines to follow. The issue is meeting the sometimes extensive testing needs of customers. On-site measurements provide a comparatively inexpensive and far less intrusive alternative to laboratory testing. An on-site testing program is possible without compromising accuracy. Control of external factors such as ambients can be achieved through shielding methods or by moving the test location to another part of the client's facility. When shielding or change of testing venue options are not viable, traditional laboratory monitor testing may be appropriate. However, under most circumstances, the client may achieve higher efficiency and lower expenditures through in-house testing.

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The author, ***ERIC A. GEORGE, ESQ.****, is an attorney and freelance writer and is associated with Ergonomics, Inc., the U.S. distributor for Combinova AB, Sweden, manufacturers of precision magnetic and electric field test equipment. (215) 357-5124.*