EMC SOCIETY of AUSTRALIA NEWSLETTER

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IEAust 11 National Circuit Barton ACT 2600

A SOCIETY OF THE INSTITUTION OF ENGINEERS AUSTRALIA

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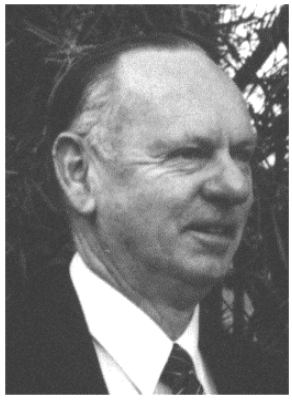
MESSAGE FROM THE CHAIRMAN



By the time this issue of the EMC newsletter goes to print the new Millennium will be two months old. It seems to me that everyone must make some reference to the new Millennium as it appears to be the "in word" at this time. I'm sure we all need to look at what the new century might bring to our EMC world.

The Senate has announced that it will hold an inquiry into electromagnetic radiation standards. The Senate inquiry into electromagnetic radiation standards will commence in April 2000. The inquiry will be conducted by the Senate's Environment, Communications, Information Technology and the Arts Committee.

The Terms of Reference are as follows:

That the following matters be referred to the Environment, Communications, Information Technology and the Arts References Committee for inquiry (to commence not before 31 March 2000) and report by 31 October 2000:

(a) an examination of the allocation of funding from the Commonwealth's $4.5 million fund for electro-magnetic radiation research and public information;

(b) a review of current Australian and international research into electro-magnetic radiation and its effects as it applies to telecommunications equipment, including but not limited to, mobile telephones;

(c) an examination of the current Australian Interim Standard [AS/NZS 2772.1 (Int): 1998], as it applies to telecommunications;

(d) an examination of efforts to set an Australian Standard dealing with electro-magnetic emissions; and

(e) an examination of the merits of the transfer of the responsibility for setting a new Australian standard for electro-magnetic emissions to the Australian Radiation Protection and nuclear Safety Agency.

In a section headed "News from ACA" we have the latest advice regarding RF EMR. Of particular note is the implementation of a process designed to provide Australia with the worlds best practice in EMR standards management. A new standard should evolve by late 2000.

This issue of the newsletter features a paper entitled "General Considerations for EMC Software" and deals with the automation of EMC testing. The author Mike Hart of Quantum Change has for many years been involved in the EMC business which strengthens the credibility of the points discussed.

I would like to encourage our members to contribute articles of interest for publication in our newsletter which will help to pass on the knowledge we have gained to others.

I trust that the year 2000 will be a satisfying year for our EMC fraternity.

John H Pluck FIEAust, SMIREE, CPEng

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INDUSTRIAL BRIEFS

NATA RF DOSIMETRY TESTING OF MOBILE PHONES

EMC Technologies Pty Ltd has extended the scope of their AS/NZS 2772 NATA accreditation for Electromagnetic Radiation (EMR) measurements, to include Specific Absorption Rate (**SAR**) evaluation of handheld or body mounted RF transmitting devices as required by the EMR Framework.

The scope of the EMR Framework includes Mobile Telecommunication Equipment (MTE) and mobile phone base stations such as AMPS, GSM, CDMA, DEC T, CT2/CT3, PHS and spread spectrum devices. These devices must be evaluated against the ACA mandatory human exposure standard, which sets basic restrictions for the **SAR** by humans. SAR is a dosimetric quantity and is defined as the rate at which RF energy is absorbed per unit mass. RF dosimetry is the quantification of the magnitude and distribution of absorbed electromagnetic energy within human and biological objects that are exposed to EMR.

A precision RF Dosimetric Assessment System (DASY) developed by the Swiss Federal Institute of Technology (ETH) is used to perform precise SAR measurements in the extreme near field. It consists of a computer controlled, high precision robotics system, robot controller, extreme near-field probes, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The six-axis robot precisely positions the probe at the points of maximum electromagnetic field.

The system also provides precise measurements in free space as well as inside tissue simulating liquids and cadavers. The flexible data evaluation and visualization capabilities allow electromagnetic design and performance evaluations in other applications including SAR optimization, EMI, EMC, PCB, wireless communications, biomedical applications and industrial RF machines.

The unique NATA accreditation includes the ACA SAR mandatory human exposure standard, as well as the European Standard ES 59005 and USA regulations per FCC OET 65 guidelines.

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General Considerations for EMC Software

by Michael J. Hart, Sr.

Abstract - This paper discusses some general concerns in automating EMC Tests. Hardware, Software and Integration issues in particular are discussed.

As the need for EMC testing grows, and it will, there is increasing interest in automating the testing environment. Automating an EMC test has a number of significant advantages over performing manual testing, but there are also significant concerns that need to be addressed.

Purpose of EMC Software

There are two primary reasons for using EMC Software, Automating Measurements and Storing information. Both of these relate to handling the vast amounts of data that can easily be generated in an EMC test. The problems encountered are slightly different depending up whether you're performing emissions or immunity testing.

Emissions testing generates the most raw data. A typical emissions scan from 30 MHz - 1 GHz with 120 kHz Resolution Bandwidth will generate over 8000 frequency points of information. Although you are really only concerned with the highest points, or those close to the specifications limits, generating a graph will require all of these points. You also must deal with cable and antenna correction factors, specification limits, and over/under limit values.

Immunity testing generally has fewer data points to handle. A typical 1% stepped frequency testing from 80 MHz to 1 GHz will cover 256 frequency points. But you may typically track a variety of instruments - probes, power meters, signal generators, voltmeters, counters, distortion analyzers, oscilloscopes - an need their values at each frequency point.

Handling this mass of data is what software does best.

Automate Measurements

When automating measurements we are concerned with three goals - providing reliability, repeatability and verifiability. Without all of these components we are wasting our time to pursue automation. Each of these impacts upon our lab in different ways.

Reliability

The reliability of our software encompasses two areas. The most obvious is how stable is the program itself? Does is run reliably for a long time? Does it crash at unexpected times? Does it save information in intermediate stages to prevent the waste of long hours of work? The more fundamental issue of reliability has to do with our ability to make changes to our testing or upgrade the functionality of our testing without impacting on our ability to perform tests.

The world of windows has added a dramatic wrinkle to the need for reliability. Under the old DOS world, or in software written under UNIX, we had a fairly controlled environment. A test, once written, had complete control of its operating environment. If there was a problem with the software, your testing was at risk, but if the program was written and tested well, then your testing would be very stable. Programs written to operate under Windows have a great advantage because of the user interface. The graphical user interface (GUI) allows for easy and intuitive screens that make the use and training very easy. Unfortunately this adds a significant level of complexity to the programmers task. You must handle a variety of screens and input devices (mouse, keyboard) as well as the instrument interfaces (gpib, serial, direct).

For this reason, Windows based programs have a well-earned reputation for sudden halts, freezes and shutdowns. They tend to be more difficult to install and get running and they also tend to require more maintenance. But they have great advantages in ease of use. And this is why most EMC software uses the GUI. It allows for easy training for new personnel and allows for easy transfer of these skills between different software packages (the F1 key does the same thing in almost all windows software).

Repeatability

The issue of repeatability is more fundamental to the EMC world. We have enough problems trying to make sure that two EUT's of the same type have the same EMC signature. To have to worry about whether our test setups were identical just adds complexity. EMC software, of any manufacturer, brings a level of repeatability to our measurements. And this is a good thing.

The issue of repeatability becomes critical if the user interface requires the operator to make too many choices during the run of a test. If you are faced with a screen that forces you to choose all your settings, then there is a strong possibility that minor changes variations in your test settings can have major impact upon your repeatability.

Verifiability

For emission measurements the issue of verifiability can be summarized best by two methods - empirical and analytical. Empirically you can setup a test sample and run a measurement test. But this raises issues involving your test sample. Is the noise being generated by your test sample stable? A more stable method would be to set a transmitting antenna in the center of your turntable. Transmit a known signal (in frequency and amplitude) and perform a measurement. Comparison of the measured values at this test frequency will give you a good feeling about the accuracy of the software in general.

But the empirical method does suffer from some accuracy problems. The accuracy of your measurements is limited to the accuracy of your hardware. If your signal generator has a small amount of amplitude instability, or frequency instability, then you will have a difficult time verifying the measurements. A good lab would have addressed most of these issues when they were doing their site evaluations, originally. But they are still issues of good engineering practice that will impact the verification process.
Analytically, one would need to observe the software running, note the frequency spans, resolution bandwidths, video bandwidths, number of sweeps and sweep times and compare these measurements with those taken manually using similar settings.

EMC Laboratory Efficiency
Another important use of any EMC software is to store information about the EUT. The issue of what and how much to store becomes one of the prime dividers of the different software packages on the market. Realistically, you need to finish a test with the frequency and amplitude of any questionable signals. These need to reflect how risk adverse your firm is - how many dB of margin around the limit that you want to work in. The different test specifications that you test to. And the purpose of this test. If your testing is done primarily for engineering evaluation of prototypes then your requirements are completely different than those of a test lab doing outside compliance testing.

Save Time
The most important issue for the software is to save the user time storing this information. If you currently sit in front of the spectrum analyzer and write down the frequencies of interest as you manually scan across the frequencies then software can save a great deal of time. The amount of time that any particular software saves can also be measured by the speed of execution, reliability of the measurements, handling of the various instruments, including towers and turntables as well as the general algorithm for performing math routines.
The issue of time can be further expanded to cover such issues as performing quick scans versus full scans. Using a quick scan to identify areas of a concern before performing time consuming manual interface can lend a degree of speed to your testing. The ability of any test software to take quick shots of your EUT prior to starting the maximization process is a key issue in saving test time.

Simplify training
Another critical element in lab efficiency is how easy to use is the software. If configuring the software is excessively complex or if the user interface is confusing, then it will be difficult to train technicians to efficiently use the software. A graphical front end that is easy and intuitive, using the latest Windows techniques will make your internal training easy and quick.
If the software requires sophisticated training, then the lab is better off to get this training at an early stage. Do not try to implement software from the manual unless you have a large amount of time to dedicate to the process. This is a prescription for frustration and failure. Training, whether provided by the software supplier, a consultant or an industry recognized training program, is a priceless commodity.

Implementation Considerations
After the decision is made to install or upgrade your EMC software, there are a few considerations that will make the process easier. Map out your equipment, current and expected, the different standards that testing will need to be performed and what types of information need to be available at the end. Finally, give close consideration to who the actual users will be since this will determine how flexible you might want the user front-end to be. Outlining this information in advance, and making it available to the various vendors being considered, will insure that there are no surprises during the installation phase. It is very frustrating to have everything there, ready to install, only to discover that this software only works with a different GPIB board or requires a faster PC.

Equipment being controlled
Not all suppliers of EMC software support all instruments. It is extremely important to match the software being acquired/updated to the instrumentation that is already owned by your company. Some of the newer software packages do not support older instruments. This forces the user to upgrade not only their software but also their hardware - an extremely expensive requirement. If you lab equipment is all supplied by the same manufacturer, you might be best served by the software supplied by that manufacturer. They will tend to have the best implementation for their hardware.
If your lab uses equipment from a variety of different vendors, it is important to insure that the software will support the different pieces. This is a critical point. Do not let your choice of software determine your choice of hardware. Choose the hardware that best meets your requirements, both price and performance, and then pick the software that supports this combination of equipment.

Standards being addressed
There are a number of standards in the world. The CISPR, IEC, SAE, ANSI, VCCI and MIL-STD are just a few. The requirements for the various types of testing - conducted emissions, radiate emissions, conducted immunity and radiate immunity - are philosophically the same under each standard. Each standards implementation of each of these test types and its impact upon your equipment requirements is not quite so simple.
The methodology used in the commercial testing is radically different from that used in most military testing. At the same time, the methodology used for conducted immunity for military standards is similar, but different, from that used for automotive testing.

The choice of software should reflect the complexity of your test requirements. Do not select a software package that only provides part of your testing. Find a software package that covers as many requirements as you can identify. This will dramatically lessen your learning curve as well as you training requirements.

End-users

When selecting an EMC Software package, consider who will be the end-user. In many labs the testing is done by a dedicated staff of EMC experts. In this case the choice of software and hardware can easily accommodate a fairly complex suite of choices and options. But if the EMC lab is commonly used by developmental engineers doing R&D evaluation, it might be wiser to select a software that has some security or control locks to prevent them inadvertently changing key parameters.

The GUI is also a point of concern when discussing who will be the end users. Some of the Windows based GUI's have significant advantages because they allow a common view to the information. Common in that most users are familiar with Windows. So such items as how to minimize windows or how to scroll a view are common knowledge among the users. If you have a situation where the users need to be locked, then more dedicated software might make sense. If you do not want the users windowing out to another application while the test is running you have an issue that calls into question the operating system that you choose.

The sophistication of the end users is also a factor when considering your training requirements. Many software packages are complex enough that you should distinguish between training for everyday users and training for test designers. Insure that your training schedule is appropriate for the level of sophistication of the users.

Good Practices

As with all engineering, there are good practices to automating your lab. Know what you want or need, acquire an acceptable product, test it in your application, and monitor it over time. With these simple rules in mind, implementing EMC Software can be a smooth, although never effortless, activity.

Define Goals and Acceptance Criteria

One of the most critical elements of any good implementation plan, whether it is EMC software or any other system, is to define your goals and acceptance criteria early in the process. This can be as simple as specifying the test that you want to be able to automate, or as complex as a suite of tests the company needs to meet in its international sales. The acceptance criteria should involve some actual measurement. A standard site source is a good type of reference since its stability removes most errors related to EUT from the measurement. If the purpose of automation is to increase efficiency, one criterion might be a timed test sequence. Comparisons between the automated test and the manual time will indicate how successful you are with the automation.

Just to reinforce the issue, before launching off on any EMC software project you should identify both the goal and reasonable acceptance criteria.

Test, Test, Test

Once you have your software in place do not rest on the first test. If you defined your acceptance as an accurate measurement of a radiated site source, you should perform this test multiple times. You are as much concerned with repeatability as you are with accuracy. Try not to let the pressures of test requirements prevent you from performing the multiple tests needed to statistically determine proper acceptance.

Follow Up

Every lab, whether it is automated or running in pure manual mode, should have a method of measuring repeatability. Using EMC software makes setting this up much easier. If you determine that there are enhancements necessary to the software, negotiate these changes at an early point. Make sure that you follow the principles stated earlier - Define your goal, acceptance criteria and test-test-test.

The Result

The end result of any EMC software project should be a smoother, more efficient operation. Your lab should benefit from this by increased throughput, faster and easier training of new personnel, increased usage of equipment, more repeatable testing, fewer callbacks (re-testing of questionable products) as well as many other factors.

Michael J Hart Snr.
President Quantum Change EMC Systems
mjhart@quantumchange.com

How to Prevent from Emission Problems on Board Level

Jan Eriksson, Technical Director Detectus AB, Sweden.

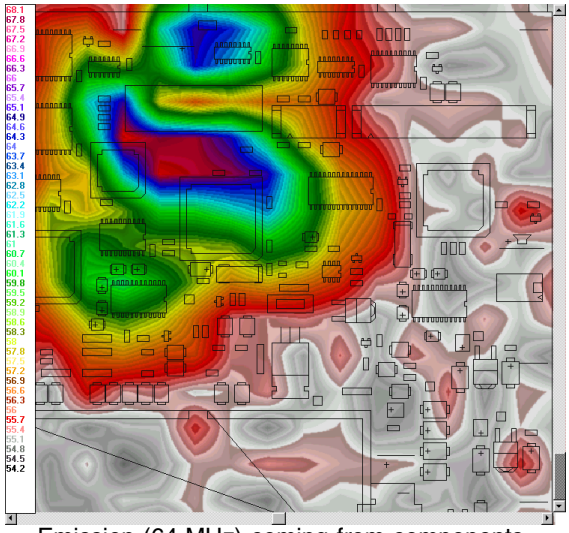
For many, the result of an EMC testing comes as an unpleasant surprise. Large amounts of time and money are spent in re-designing the product, which causes lengthy delays. The main cause of these additional costs and delays can be related to the designer's opportunities and desire to perform an EMC test on the product as early as possible. In this article, we will give some simple advice and examples of test methods useful for avoiding undesired emission.

The final test is of course performed on the entire system or product, but the EMC planning must be applied right from the concept stage!

Simple rules
To avoid unpleasant EMC surprises, these rules must be followed:

1. Start measuring as early as possible in the design process.
2. Find the source of the problem.
3. Correct the problem on component level.
4. Perform tests regularly during the design process.
5. Perform tests according to existing EMC directives.
6. Perform quality tests during manufacturing.

Emission pre-test
Previously, designers have only used spectrum analyzers and near-field probes when searching for emission sources on board level. This measuring method has been time-consuming and non-repeatable. Therefore it has left large uncertainties about where the source of the problem is located and how different design modifications affect the total emission.



Emission (64 MHz) coming from components on a PCB.

By connecting the spectrum analyzer and near-field probe to an EMC scanner, the designer can now build an ideal measuring instrument for emission pre-test on board and equipment level. This measuring method makes the pre-tests simpler and cheaper because the designer can perform the measurements and evaluate the results himself. The emission sources can easily be studied graphically, and the results of different design modifications can be quickly compared.

Design rules
The board design has a fundamental importance for giving the system or product good EMC characteristics. The designer must follow these rules:

- Don't use a higher voltage or current than necessary.
- Don't use faster circuit devices than necessary.
- Use short connections on all levels.
- Use properly designed grounding, shielding and filtering.

Avoid large HF-current loops by using decoupling capacitors, multiple voltage planes, a properly designed zero potential plane, as well as twisted pairs to keep the signal and return lines close together.

Board layout
A proper layout must minimize current loops while minimizing the inductance of all parts used for signals with fast rise and fall times. To avoid crosstalk, sensitive signal conductors must be kept separated. The power supply distribution must have low induction (multi-layout).

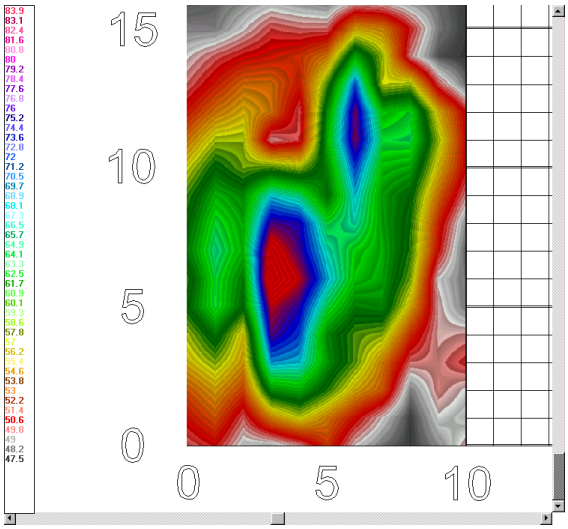
Logical circuits
When choosing logical circuits, follow these rules:

- Choose as ”slow” a clock frequency as possible, and duty cycles as close to 50% as possible.
- Force unused inputs and outputs to a predetermined potential.

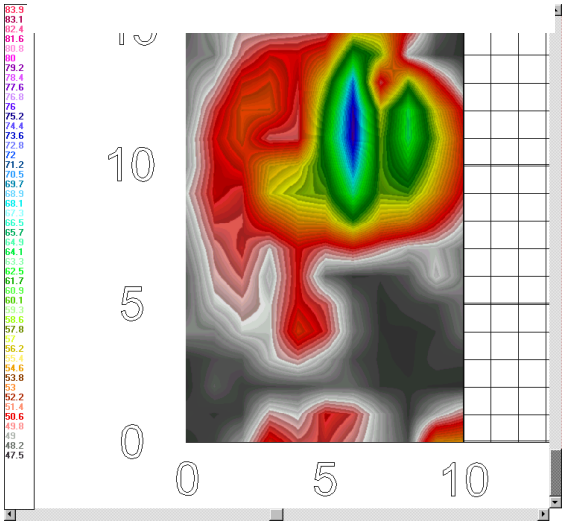
Place signal and return lines as close together as possible.

Decoupling capacitors
The decoupling capacitor has to protect the circuit from transients, and this is achieved by:

- Place the capacitor as close to the supply leads as possible (minimize the current loop).
- Use a capacitor with a size as small as possible.



Circuit board (100*160 mm) with a bad ground plane (40 MHz fields).



Circuit board (100*160 mm) with improved ground plane (40 MHz fields).

Filters
Use filters to minimize interference on inputs and outputs to circuits and boards. These filters will work as a ”barrier” between two zones.

Shielding
Shielding is used to ”isolate” the emission from a source by applying e.g. screen boxes and shielding materials. This method is often expensive and therefore used only when no other solution is working. However, you must remember that shielding can cause problems with temperature as well as with oxidation that might eventually degrade the shielding effect.

The EMC directive
The product must of course be tested for compliance within the existing EMC directive. What you often forget after the CE approval is what will happen with the product when it has been manufactured for some time. Often some parts of the product are changed (new components or component suppliers). This might cause the product to change its EMC characteristics to those originally approved. In this case, the EMC scanner can also assist in performing emission tests to find out if any changes of the EMC characteristics have occurred.

Conclusion
To make a product as inexpensive and good as possible, you should consider EMC matters from the very beginning of the design. Pre-tests should be performed as early as possible, and problems should be corrected on component and board level.

Perform EMC test according to existing directives.

Perform tests during manufacturing to ensure that the EMC characteristics of the product are not degraded after some time.

”See it before you CE it”

* All measurements and pictures made by EMC-system DS642, Detectus AB.

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NEWS FROM NEW ZEALAND

EMC Technologies NZ L 16/2/2000 are now able to offer accredited radio testing facilities for transmitters exported to Europe. The scope of accreditation has been extended to include I-ETS 300 330 and EN300 220-1 for low power transmitters operating between 100 kHz and 1000 MHz along with ETS 300 683 which covers the EMC requirements of these devices. Measurements are performed on transmitters and receivers that operate between 100 kHz and 26 GHz with powers ranging from 1 pW right up to several hundred watts. Testing to ETS 200 086 for Europe, is also offered based upon the individual tests that have already been accredited.

Contact: Andrew Cutler aucklab@ihug.co.nz

BOOK REVIEW

Electromagnetic Shielding Handbook for Wired and Wireless EMC Applications,

Anatoly Tsaliovich, 682pp,
ISBN 0-412-14691-6,
Kluwer Academic Publishers

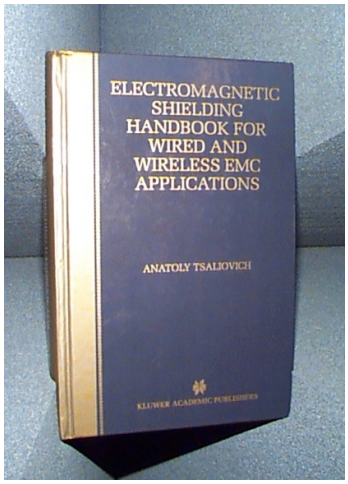
Reviewed by Steve Offer

Table of Contents

This book appears like a formal reference publication with a difference. Unlike many formal reference books the majority of this work is actually enjoyable to read. The author frequently uses a clearly marked italic notes technique, similar to editors notes, to discuss points of interest, refresh to reader on basics, inject humor and to introduce opinion and knowledge gained from experience. This format allows the objective facts to stand as presented; but, enables the reader to better interpret, understand and apply these facts.

The starting point is a sound introduction to EMC. It introduces the philosophy of an "EMI channel" made up of EMI sources or generators; the paths and mechanisms by which generated energy couples, and EMI receptors. Each aspect of this "EMI channel", and measures to control them, are then explored. Most of the basics are covered; but, I don't recall seeing some of the aspects covered in any other text, these included the effects of mismatch on clock line emission spectra and the radiation patterns of various unintended radiators.

The remaining chapters go on to focus mainly at system level and on electromagnetic shielding. Importantly, the limitations and correct application of shielding is covered first. Then the problem of the existence of a large variety shielding effectiveness definitions and the lack of a uniform measurement technique is discussed. It is proposed that the Transfer Parameters of the shield be used to determine its effectiveness; and, methods of measurement with electrical and mathematical models are presented. This makes so much sense; and, given that the electronics industry historically begin to analyze an unknown in this manner it is surprising that the industry hasn't already standardized on such an approach. Almost every conceivable application of shielding is covered; just a few are product enclosures, architectural shielding, vehicles, printed circuit cards and cables. Emphasis is placed on determining the correct degree of shielding effectiveness, including apertures and slots, and ensuring that it is achieved when installed in its intended environment. The mathematics is a little tiresome; but, is kept to the minimum required.



The conclusion finishes the book well. New shielding technologies such as; leaky coax, plastic shields, ferromagnetic absorptive shields, superconductors and chiral shields are discussed.

I think this book would be a valuable tool for those involved in engineering electronic systems or designing EMC test facilities. The title of the book accurately describes its' scope. However, the material covered is broad with skillfully selected detail. Normally this could compromise such a reference book, not in this case, I think it enhances the book. I would recommend it as a "hands on" guide to anyone involved with EMC.

PRODUCT REVIEW

The new ESI family combines the flexibility and speed of spectrum analyzers with the large dynamic range expected of EMI test receivers. They meet all requirements to the full, making them the ideal choice for EMI measurements to standards as well as for general-purpose measurements in the development lab. ESI 40, which is the successor of the ESAI, ESBI and ESMI family of test receivers, opens up the frequency range to 40 GHz in its basic configuration already.

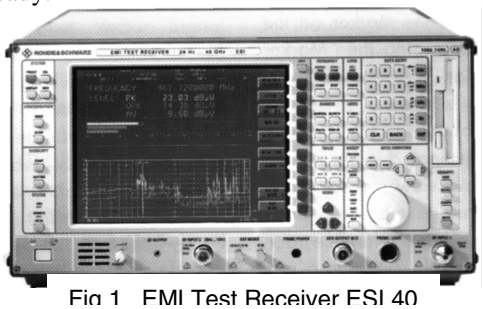


Fig 1 EMI Test Receiver ESI 40

The **ESI Family comprises three models** with different frequency ranges:

- ESI7 20 Hz to 7 GHz
- ESI26 20 Hz to 26.5 GHz
- ESI40 20 Hz to 40 GHz

The frequency ranges of models ESI26 and ESI40 can be extended further by connecting an external mixer (option FSE-B21).

The ESI models are based on their outstanding values of sensitivity and dynamic range [1; 2]. ESI features **integrated preselection** and so ensures large-signal immunity, which is a vital prerequisite for EMI test receivers.

These instruments are therefore extremely well suited for all electromagnetic emission measurements to industrial and military EMI standards such as CISPR, VDE, ANSI, FCC, EN, VCCI, MIL-STD, VG, DEF-STAN, BS, DO160 or GAM EG13.

RFI voltage. The voltage peaks occurring in RFI voltage measurements, for example during phase switchover of an artificial mains network, really make great demands on the pulse-handling capability of the RF input. ESI overcomes this problem by means of a second input for the frequency range 20 Hz to 1 GHz, which, in the case of ESI 7 for example, can handle pulses up to 1500 V with maximum energy of 30 mWs.

The **autorange** function sets the correct combination of attenuation and gain in the signal path for the applied signal.

RFI field strength
Measurement of RFI field strength in the frequency range 30 to 1000 MHz is carried out with the quasi-peak detector.

In measurements using the peak detector, the noise floor in CISPR bands C and D is typically 4 dB higher than with the quasi-peak detector. But ESI test receivers have an **integrated, switchable preamplifier** that increases sensitivity so that the noise floor is sufficiently below the limit value.

The over view measurement is carried out in scan mode. ESI measures the spectra between start and stop frequencies, defined in a **user-configurable scan table.** The table may comprise up to ten frequency ranges, each of which can be combined with user-selected receiver settings such as bandwidth and measurement time to match the measurement to a given test specification.

ESI features **simultaneous measurement and display of four test traces**, which can be assigned different detectors and display modes. Displaying the peak value and average value both in the clear-write and max-hold mode is therefore no problem

For **final measurements in line with standards**, ES provides graphic display of overview measurement results in one window, and receiver display with frequency and level indication in a second window.

Measurements to military standards.
Military standards also call for measurements at higher frequencies, e.g. between 30 Hz and 40 GHz in accordance with MIL-STD-461. The ESI models cover the required frequency range and offer the necessary IF bandwidths from 10 Hz to 1 MHz in decade steps. To achieve high sensitivity required for measurements to MIL-STD-461 RE 101 in the frequency range above 30 Hz - the unavoidable feedthrough of the 1st LO is suppressed in ESI test receivers by self-alignment of the mixer. ESI consequently features a sufficient margin from relevant limit values even in the lower frequency range. **Standard measurements.**
Apart from EMI measurements ESI is also highly suitable for general-purpose measurements as a high-grade spectrum analyzer

Automatic measurements, test systems.
ESI, itself a **full-featured PC with keyboard and mouse connectors,** operates under Windows NT®, which allows the use of any Windows® software and convenient integration of ES into network environments.

Combined with EMI Software ES-K1 for example, ESI is turned into a fully-fledged controller of complete EMI measurement systems capable of controlling even accessories like antenna masts and turntables.

Courtesy Rohde & Schwarz (Australia) Pty Ltd rsaussyd@ozemail.xom.au

NEWS FROM ACA

EMR standard—new developments

from the Australian Communications Authority

ACA regulatory arrangements limiting exposure of the general public to radiofrequency electromagnetic radiation (RF EMR) from radiocommunications transmitters commenced on 1 February 1999. The exposure limits on which the regulations are currently based are taken from the lapsed standard AS/NZS 2772.1(Int):1998 Radiofrequency fields Part 1:Maximum exposure levels-3 kHz to 300 GHz.

The ACA intends to continue with the limits of AS/NZS 2772.1(Int):1998 for at least the next phase of its regulatory arrangements to protect the public from the known thermal effects of exposure to emissions from radiocommunications transmitters. The next phase will extend application of the standard to most cellular mobile telephone handsets and base stations, satellite phones and cordless phones. This includes GSM 1800 MHz cellular mobile handsets, 915, 928 and 2400 MHz cordless phones and 1600 MHz satellite phone handsets.

However, a consultative process has commenced which aims to provide the Australian public with world's best practice in EMR standards management. The ACA has proposed a dual approach to regulation of EMR that includes the development of a technical, limits-based standard in parallel with a code of practice to address the non-technical matters of concern to the community. Representatives of the telecommunications carriers, unions and the community have agreed in principle to this approach.

Implementation of this proposal requires participation by other standards-making bodies in a process that the ACA estimates will take between 12 and 18 months to complete. To this end, the ACA has embarked on a cooperative process with both the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and the Australian Communications Industry Forum (ACIF).

The new standard, incorporating evidence-based exposure limits, is being developed by an expert group under the auspices of ARPANSA, an agency within the Commonwealth Health and Aged Care portfolio. The provisions of the *Australian Radiation Protection and Nuclear Safety Act 1998* give ARPANSA the power to develop national standards. The development process will include consultation to ensure all stakeholders have an opportunity to comment and contribute. The standard will be based on exposure limits for RF EMR fields in the range 3 kHz to 300 GHz that are consistent with current, peer reviewed scientific findings and world's best practice.

The proposed timeframe for publication of the completed standard is late 2000.

To complement the standard in accordance with the ACA's dual approach, ACIF has agreed to develop a code of practice. The code is intended to address the precautionary approach to the exposure of persons to EMR resulting from the provision of telecommunications services in Australia.

A working committee under ACIF's Radio and Environment Reference Panel has commenced development of the code with regard to RF fields resulting from the installation and operation of radiocommunications infrastructure. The committee's task is to identify best practice which keeps RF exposure to the lowest practical level while still delivering a mobile telecommunications service that is cost effective. Design, risk communication and mitigation, and operations are issues to be addressed.

Membership of the committee includes an appropriate and balanced representation of interested, affected sectors including carriers, consumers and the community including local government, industry associations, occupational health and safety bodies and regulators.

The proposed timeframe for publication of the code is late 2000.

Information on further developments can be obtained by contacting the ARPANSA Information Officer.

- telephone (03) 9433 2211;
- from the ARPANSA website at: www.arpansa.gov.au;
- from the ACA on telephone (02) 6256 5203; or

from the ACA website at: www.aca.gov.au/standards/emr.htm.

ACA “C-Tick” Clarification

The December edition of ACA Connections (Issue 9) contains a factual error relating to the replacement of the C-Tick compliance mark with the A-Tick compliance mark for radio communications, electrical and electronic product.

The ACA has issued a clarification which reads as follows:-

Labelling Clarification

The article on page 7 of the December edition of ACA Connections (Issue 9) contains a factual error relating to the replacement of the C-Tick compliance mark with the A-Tick compliance mark for radiocommunications, electrical and electronic product The ACA has not taken the decision to replace the C-Tick mark for these types of product.

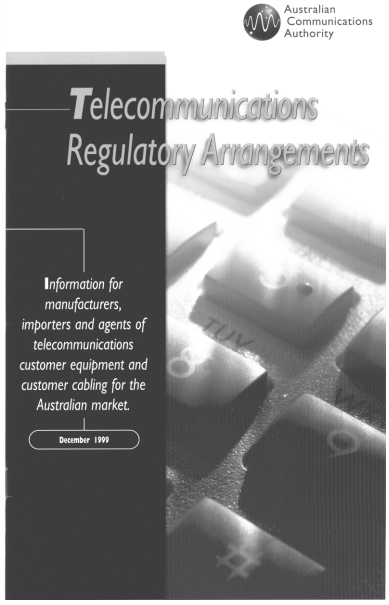
The article should have referred only to telecommunications customer equipment ("phones, faxes, answering machines etc.).

Where an item of telecommunications customer equipment is required to comply with the radiocommunications, electromagnetic compatibility and/or electromagnetic radiation regulatory arrangements as well as the telecommunications regulatory arrangements that equipment can use a single compliance mark (the A-Tick) to indicate compliance with all applicable ACA regulatory arrangements.

All other radiocommunications, electronic or electrical devices will continue to use the C-Tick mark to indicate compliance with the applicable ACA regulatory arrangements.
The ACA apologises for any concern the ACA Connections article may have caused and trusts this information now clarifies the situation as it applies to the above product.

If you require any additional information on this issue, please contact Ian McAlister on telephone (02)62565451; fax (02)62532424, or email ian.mcalister@aca.gov.au.

ACA Publications:



In December 1999 the ACA published a new information booklet entitled "Telecommunications Regulatory Arrangements". This booklet deals with equipment labelling, compliance matters and levels and previously approved products. The booklets are available from ACA offices or the contents can be obtained from the ACA's website (www.aca.gov.au / standards/index/htm).

Other booklets which are published by the ACA are:

- "Electromagnetic Compatibility" booklet which covers the requirements of the EMC framework
- "Radiofrequency Electromagnetic Energy" which covers mandatory human exposure standard and compliance framework.
- "Radiocommunications Standards" which covers information to manufacturers and importers of radiocommunications equipment for the Australian market.

Again, details of these publications can be downloaded from the ACA website. Reference to the website is an easy way for a company to obtain a software copy of the two main forms which are used, namely "Application to use the CTick Mark" and "Supplier's Declaration of Conformity".

The ACA website is well worth a regular visit by those involved in regulatory matters for their employers or businesses, so as to be up to date with the legislation and publications.

CURRENT AUSTRALIAN/NEW ZEALAND STANDARDS

* AS/NZS	1044:1995	Household motor operated and thermal appliances, electric tools and similar appliances
* AS/NZS	1053:1999	Sound and TV receivers and associated equipment
* AS/NZS	2064:1997	Industrial, scientific and medical radio frequency equipment
AS/NZS	2344:1997	Overhead a.c. power lines and high voltage equipment (0.15 to 1000 MHz)
AS	2362.7-1990	Automatic fire detection and alarm systems
* AS/NZS	2557:1992	Vehicles, motor boats and spark-ignited engine driven devices
AS/NZS	3200.1.2:1995	Medical electrical equipment – General requirements for safety and EMC
AS	2772.2-1998	Radio frequency radiation, Pt 2. Principals and Methods of measurement.
AS	4428.0-1997	Fire detection, warning, control and intercom systems
* AS/NZS	3548:1995	Information technology equipment
* AS/NZS	3652 (Int):1998	Arc welding equipment
* AS/NZS	4051:1998	Lighting and similar equipment
* AS/NZS	4251.1:1999	Generic emission standard Residential, commercial and light industry
AS/NZS	4417.1:1996	Marking of electrical goods to indicate compliance, general rules
AS/NZS	4417.3:1996	Specific requirements for EMC regulatory applications
AS/NZS	4448:1997	Protection of receivers on board vehicles
AS/NZS	61000.3.2	Limits for harmonic emissions (current equal to or less than 16A)
AS/NZS	61000.3.3:1998	Voltage fluctuations and flicker (current equal to or less than 16A)
AS/NZS	61000.3.5:1998	Voltage fluctuations and flicker (current greater than 16A)
AS/NZS	1088.9:1995	Hearing Aids, Immunity requirements
** AS/NZS	4053:1997	Sound and TV receivers and associated equipment (Immunity)
** AS/NZS	4252.1:1994	Residential, commercial and light industry (Immunity)
AS/NZS	1052.1:1995	Radio disturbance and immunity measuring apparatus and methods
AS	60870.2.1:1998	Telecontrol equipment and systems operating conditions, power supply
AS	4168.2:1994	Programmable controllers, equipment requirements and tests
AS/NZS	3947.1:1998	Low voltage switch-gear and control gear
AS	1284.5:1992	Electricity metering, general purpose watt hour meters
AS	1284.6:1992	Electricity metering ripple control receivers for tariff and local control
AS/NZS	61000.4.7:1999	General guide on harmonics and interharmonics for power supplies and connected equipment
AS/NZS	4251.2:1999	Generic emission standard Industrial environments
AS/NZS	1052.2:1999	Radio disturbances and immunity measuring apparatus and methods
AS/NZS	61000.2.3:1999	Radiated and non-network frequency-related conducted phenomena
AS/NZS	61000.2.5:1999	Classification of electromagnetic environments
AS/NZS	61000.4.1:1999	Overview of immunity tests
AS/NZS	61000.4.5:1999	Surge immunity test
AS/NZS	61000.4.6:1999	Immunity to conducted disturbances, induced by radio frequency fields

Emission Standards

The Radio Frequency (RF) emission standards are intended to reduce the levels of intended emissions from electrical and electronic goods to an acceptable level.

* **Introduced** on a mandatory basis from 1 January 1997 and are the first standards to be phased in by the ACA as part of the EMC framework. The subsequent ACA Radiocommunications (Electromagnetic compatibility) Standard 1998 issued on 11th November, 1998, designates which AS/NZS standards currently apply. Updates of the relevant EMC framework standards are listed above, together with other published standards with EMC tests.

**** Immunity Standards**

Immunity standards are not currently mandatory under the EMC framework. The basic strategy of the EMC framework is to provide for management of both emissions and susceptibility over time. The role of immunity standards is to establish a basic level of protection for products that are susceptible to interference effects. The ACA has advised that it will reconvene a working group to consider extending the EMF framework to cover immunity standards and systems and installations. ACA staff members are preparing a discussion paper on these issues and have requested input on the application of immunity standards and how EMC standards might be applied to systems and installations.

Amendments to IEC 61000-4.3

Three new amendments are proposed for IEC 61000-4-3 Electromagnetic Compatibility (EMC) Part 4.3 Testing and Measurement techniques – Radiated RF Electromagnetic field immunity test.

One amendment provides for an alternative procedure to the anechoic chamber – testing within a reverberation chamber.

The second amendment concerns using IEC 61000-4.3 test methods for frequencies above 1 GHz.

The third amendment is for a revision of the calibration procedure and verification of the correct application of the modulation during the test. This amendment presents the way to calibrate the test zone based on the constant electric field strength.

Report on EMC SLIM

At its October 1999 meeting, the SLIM Working Groups have made proposals for modification of the EMC Directives. The Working Groups' objectives are to make the Directives simpler with clearer definitions so that there are fewer problems associated with their interpretation.

The modifications include proposed amendments on the definitions of Passive Equipments, Fixed Installations, Systems and Components. The proposals were to be available in draft by the end of 1999.

EMC Harmonics Standards.

IEC 61000-4.13 Harmonics and interharmonics including mains signalling at AC power port low frequency immunity tests is being circulated for comments. It gives severity levels for the different classes of environment as well as those to be applied when the mains network is used for mains signalling.

NATA ACCREDITATIONS

The following test houses have NATA accreditation.

ADI Limited
Test and Evaluation Centre
Forester Road
St Marys NSW 2760
Telephone: (02) 9673 8374
Facsimile: (02) 9673 8321
Manager: John Duffett

Austest Laboratories
Ground Floor
35 Alleyne Street,
Chatswood NSW 2067
Telephone: (02) 9882 6500
Facsimile: (02) 9882 6600
Manager: Gunther Theisz

EMC Technologies Pty. Ltd.
57 Assembly Drive
Tullamarine VIC 3043
Telephone: (03) 9335 3333
Facsimile: (03) 9338 9260
Technical Director: Chris Zombolas

EMC Technologies Pty. Ltd.
16/6 Gladstone Road
Castle Hill NSW 2154
Telephone: (02) 9899 4599
Facsimile: (02) 9899 4019
Manager: Les Dickenson

R.F.I. Industries Pty. Ltd.
6/381 Bayswater Road
(PO Box 254)
Bayswater VIC 3153
Telephone: (03) 9720 8522
Facsimile: (03) 9720 8437
Senior Engineer: Malcolm Mulcare

Testing and Certification Australia
14 Nelson Street,
Chatswood NSW 2067
(PO Box 841, Artarmon NSW 2064)
Telephone: (02) 9410 5111
Facsimile: (02) 9415 1567
Technical Officer: Colin Payne

CALENDAR OF EVENTS

March 16 -17 First Japanese-Australian Joint Seminar on Applications of Electromagnetic Phenomena in Electrical and Mechanical Systems.
University of South Australia
Professor Andrew Nafalski Phone +61 8 8302 3320

May 3 – 7 Second Asia-Pacific Conference on Environmental EMC,
Shanghai, China.
Professor Gao Yougang
e-mail faoffice@bupt.edu.cn

May 14 – 19 Conference on Precision Electromagnetic Measurements – CPEM 2000
Sydnewuy Hilton, Australia
Barry Inglis, Conference Chairman
Cpem2000@townhosts.com.au

June 27 – 30 15th International Wroclaw Symposium and Exhibition on Electromaagnetic Compatibility,
Wroclaw, Poland
Info: EMC Sympsium and Exhibition
Box 2141 51-645 Wroclaw 12
Poland
Fax +4871 372 8878 e-mail emc@il.wroc.pl

August 15 – 18 ISAPE 2000 5th International Symposium on Antennas, Propogation and EM Theory.
Beijing, China
Meng-Qu Zhou
e-mail mqz@public.bta.net.cn

August 21 – 25 IEEE International Symposium on Electromagnetic Compatibility
Washington, D.C.
Bill Duff - Telephone 703 914 8450

September 11 – 15 European EMC Symposium
Brugge, Belgium
Professor Johan Catrysse
e-mail johan.catrysse@kh.khbo.be

EMC ASIA 99 TAIPEI, TAIWAN

2nd International Exhibition with Workshops on Electromagnetic Compatibility

The second EMC Asia event was held in Taipei, Taiwan from December 7 to 9. Originally scheduled for Singapore in May 1999, it was transferred to Taiwan. The event was organised by the intrepid Mesago of Germany and sponsored by the Industrial Technology Research Institute (Taiwan) and held in the Taipei International Convention Center.
Over 65 international and local exhibitors from the EMC industry utilised the 800 square meters of exhibition space and it was attended by 1200 mainly local visitors.

There were 24 high quality EMC workshop parallel to the exhibition presented by speakers from Europe, USA, Australia and Asia.. The Workshop presentations were practical and application oriented, structured to combine field experience with EMC research. Topics included EMC at Chip Level, Calibration of EM Fields, EMC in the Railway industry, EMC testing and many other interesting topics on EMC. Australia was represented by Chris Zombolas of EMC Technologies who spoke on EMC Precompliance Testing In-House and Franz Schlagenhaufer of EMCSI who spoke on EMC Analysis of Complex Systems. All workshops were well attended, the three most popular being EMC Shielding and Design, Grounding Design and Implementation and Controlling Radiated and Conducted EMI by Design.

The 3-day event was deemed a success by the organizers who hope to stage it again next year.

NEW MEMBERS

For those who have not yet joined our EMC Society we would ask you to fill in our membership application form and encourage your colleagues to follow suit. If you have applied for membership but not yet received an invoice from IEAust, would you please fill in and submit a new application form.

MAILBOX

We invite all our members and readers to participate in our quarterly newsletter. In order to produce a better newsletter and provide our readers with the information and items of interest looked for, we welcome your comment, advice and criticism. Particularly, we would look forward to receiving technical articles, amusing anecdotes and items of general interest to the EMC community.

CORPORATE MEMBERSHIP

The EMC Society offers corporate Membership to organisations who may wish to nominate up to three people for membership. It also provides an important source of funding to the Society and we would like to take this opportunity to recognise the 1998 corporate Members.

ADVANTEC ELECTRONICS Pty Ltd is a registered NATA test house with accreditations for testing to TS001, TS002, TS004, TS006 and TS008.
Contact: David Stocks (02) 9477 7757

ROBERT BOSCH AUSTRALIA is a manufacturer of white goods and specialised electronic automotive products.
Contact: Steve Offer (03) 9541 5474

TENIX DEFENCE SYSTEMS is a manufacturer of specialised defence systems.
Contact: David Willetts (03) 9244 4134

The EMC Society would like to express gratitude to Advantec, Robert Bosch and Tenix Defence for their support in 1999.

Institutional Listings

The IEAust Electromagnetic Compatibility Society is grateful for the assistance given by the firms listed and invites application for Institutional Listings from other firms interested in the electromagnetic compatibility field.

Institutional Listings

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CE Immunity
EN50082-1, 2
IEC 1000-4-2 ESD
IEC 1000-4-3 Radiated RF
IEC 1000-4-4 Transients
IEC 1000-4-5 HV Surge
IEC 1000-4-6 Conducted RF
IEC 1000-4-8 H Fields
IEC 1000-4-11 PS Interruptions

All C-Tick Standards
AS/NZS 2557 / CISPR 12: Auto, Ignition
AS/NZS 1044 / CISPR 14: Appliances
AS/NZS 1053 / CISPR 13: TV, Radio, Audio
AS/NZS 2064 / CISPR 11: ISM
AS/NZS 3548 / CISPR22: ITE
AS/NZS 4051 / CISPR 15: Lighting
AS/NZS 4251 / EN50081: Generic Emissions
AS/NZS 4252 / EN50082: Generic Immunity

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An Institutional Listing recognises contributions to support the publication of **THE IE AUST ELECTROMAGNETIC COMPATIBILITY SOCIETY** newsletter. Minimum rates are $200.00 for a listing in one issue. Larger contributions will be most welcome. No agency fee is granted for soliciting such contributions. Inquiries, or contributions made payable to the EMC Society, plus instructions on how you wish your Institutional Listing to appear, should be sent to the Editor, EMC Society Newsletter, IE Aust, 11 National Circuit, Barton, A.C.T. 2600.