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On the Importance of Electromagnetic Compatibility

Gary Breed
Editorial Director



One of the themes I periodically return to in this column is EMC, electromagnetic compatibility. With the IEEE EMC Symposium taking place during July, this seems to be the right time to step up on my EMC soapbox again!

My main point in this column is that engineers seem to have two distinct perspectives on EMC, and often do not realize that they are connected.

The most common idea of EMC is meeting performance criteria spelled out by regulatory and industry standards for maximum radiated emissions—and, in some parts of the world, for immunity to exposure from external fields. By establishing these standards, The FCC and its worldwide counterparts hope to minimize unwanted interference from electronic devices.

Devices that receive signals carried by radio waves are sensitive, and operate on internationally agreed-upon frequencies. In addition, the transmissions are often licensed, and those licenses may have been obtained with large expenditures in spectrum auctions or business transactions. As we know by hearing or watching radio/TV commercials (or fund drives), and by making direct payments to wireless operators and satellite entertainment providers, lots of money changes hands around radio communications. With fortunes at stake, licensed users expect to be protected from interference by devices that should not be creating 'radio' signals at all.

Although not regulated in the U.S., immunity performance standards are intended to protect the consumer's investment in electronic equipment. None of us would be happy if our new gadgets are compromised by susceptibility to nearby—and completely 'clean'—authorized transmissions by broadcast stations, satellite uplinks, navigation equipment, commercial and public safety 'two-way' radio, or amateur radio installations. Or ... your own cell phone, WiFi, baby monitor, security system, or any other of the many low power transmitters that may be in proximity to those dozens of electronic devices we all have.

The case for EMC standards seems clear. Regulatory minimum stan-

dards cover a majority of potential problem areas, while voluntary industry standards impose more stringent requirements when it is in the interest of good business to do so. Unfortunately, in recent years, the FCC leaned toward a Wild West approach by approving systems with questionable ability to meet existing standards, then proposing that standards be lowered or re-defined. Hopefully, that attitude will return to one of balanced protection to both business and consumer.

Internal EMC

The other side of electromagnetic compatibility is self-interference, including the common problems of crosstalk, coupling, noise and hum that must be solved before a product can be considered to be operating properly. These issues are

viewed as design problems, not regulatory ones, despite the fact that the result is largely the same—if it does not have good EMC performance, it won't work right for the end user!

Increasingly, however, design engineers are doing a better job incorporating regulatory considerations for EMC at the same time they are dealing with functional design issues. There are some real geniuses working on robust, compliant design of PC motherboards and peripherals, wireless handsets, and other common electronic products. Unfortunately, I have not been able to get them to write about it, since the techniques they have developed are usually protected as valuable company secrets.

Finally, here's a note that is not a secret, but is also not appreciated by enough engineers—all the tech-

niques applied during design to improve functional performance will also make it easier to achieve regulatory compliance. Conversely, any techniques that have been developed to design-in better radiated emissions performance or immunity to interference, will almost certainly reduce the number of internal problems.

EMC is EMC, whether it is for the compliance testing site or to keep the MPU clock from modulating the local oscillator!

More About 50 Ohms

I'm overwhelmed! Last month's column about the origins of 50 ohms as a 'standard' brought more response than *any* editorial I have ever written. We'll present some of the more interesting historical notes in the August Design Ideas column. Thanks for the feedback!