The Future of EMC Engineering

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Locating RF Energy on a Printed Circuit Board

In the last issue, we examined the definition of who we are as a profession, which is an electrical engineer and nothing else; not analog, digital, digital microwave, or microwave. Everything we work with is analog. With this said how do those who are comfortable with wave propagation (RF), and only work with spectrum analyzers, identify and solve an EMC event?

We know there must be a source, path and receptor for an EMC event to occur. If a radiated problem occurs during testing, how do we quickly locate the source? Many will bring out near-field probes and start sniffing areas on a printed circuit board where undesired energy appears to be coming from. We sometimes use current clamps to determine if there is a radiated field present on interconnects. This works great in determining the approximate location of where the problem is but not the source. More experienced engineers will look at a schematic for potential sources and immediately start replacing discrete components at random hoping to find a cure. Using only a spectrum analyzer to assess the magnitude of change may provide a false sense of security since we usually investigate near-field emissions which are usually different in the far field. When locating the source of RF energy on a transmission line or from a component during troubleshooting, I prefer to use a high bandwidth oscilloscope instead of a spectrum analyzer. For most situations, the magnitude of a signal integrity problem is the magnitude of common-mode current developed, and with efficient transmission lines (e.g. traces) on printed circuit boards present, we have an EMC event.

A signal integrity problem is usually the result of poor transmission line routing and implementation. How do we know if the ringing measured on a transmission line with an oscilloscope is the cause of a radiated field if we only use a spectrum analyzer? How many EMC engineers prefer scopes over analyzer? One must be knowledgeable with transmission line theory and operation in the time-domain as well as observing RF in the frequency domain using all available resources.

Remember, in order to solve any engineering design problem, one must be comfortable using a variety of instrumentation and tools. If we are weak with the field of circuit design and analysis, or transmission line theory, now is the time for continued education.

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