EMC "Myths Versus Reality" #3

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THE FIRST AXIOM OF SYSTEM-PRODUCT DESIGN

The myth: Electromagnetic Compatibility (EMC) performance was first initiated toward system-product *compliance* with the requirements of regulatory agencies through standards applications.

The reality: EMC performance criteria was conceived to assure system-product *functionality*.

In history and in the reality of practice, the essential and fundamental ***first axiom of systems-product design criteria*** is actually Electromagnetic Compatibility (EMC): ***The systems-product circuits, signals, modules, circuit architecture, and sub-systems must be functionally compatible within themselves!!*** In recent years, understanding and application of the term "EMC" seems to have become increasingly and narrowly (inappropriately) limited to defining the comparative performance between the EMI immunity and emission requirements that have been made mandatory from regulatory agencies, and the profiles exhibited by system-products. In history, however, the intention of EMC as both a term and a process was to assure that the integrated system or system-product would perform as intended within defined functionality requirements with regard to: A) sources of fields and currents within the designs themselves at the unit-level for signal integrity and signal / noise ratios; B) sources of fields, potentials and currents produced ***to*** and ***from*** other modules/units of a system or among multiple systems in a common "platform" environment ; and, C) sources of fields, potentials and currents ***to*** and ***from*** the external operating "environment".

The suggestions stated in item "B" above are carried forward in military or space implementations to define the first increment of "environment" as that within a common-platform, such as warship, spacecraft, or an air frame (war bird). The concept in those applications is sufficiently compartmentalized to conceptualize the "envelope" of the common-platform (often a weapons, surveillance, or communication package) first as an "environment" within itself, and secondly with that "envelope" as a platform to determine EMC to the intended operating environment external to the platform. These concepts are typically conveyed through "environmental" specifications such as MIL-E-6051. For that application, the "measurement" processes are intended to assure that no component or sub-system interferes with the needed operation of any other component or sub-system, and that fields to or from the platform as a whole, are compatible with a rigorous (e.g. battlefield) "operating environment". In commercial parallels, the "platform" could be any individual package, such as a desktop computer or a medical device. Within these descriptions, it is observed that specific EMI emissions or susceptibility (immunity) specifications are only interim tools to increase confidence that the goals of the ultimate functional" environmental" demand will be achieved.

Given this viewpoint, it can be expanded that signal integrity, signal timing (propagation time), signal perturbation, cross-talk and coupling, signal-to-noise ratios, common-mode containment and partitioning, common-mode architectural derivations, power delivery-quality, and electromagnetic field captures and exclusions, are all mutually ***inclusive*** of the term “EMC”. In impact, great performance profiles in regard to all of these sub-set characteristics of EMC will combine to truly produce a thoroughly integrated and compatible system-product for factors of compatibility within itself, with other systems, and to or from the external environment.

The conclusion may be gained that the limited definition of system-product “compliance” with the requirements of regulatory agencies does not adequately relate the whole significance of what the term “EMC” really in fact is intended to, or in reality, represents.