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American National Standard Recommended Practice for Electromagnetic Compatibility Limits and Test Levels

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Accredited Standards Committee C63®—Electromagnetic Compatibility

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American National Standards Institute

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USA

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Secretariat
Institute of Electrical and Electronics Engineers, Inc.

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Abstract: A rationale and recommendations for developing emission limits and immunity test levels are presented in this recommended practice. These limits and levels are representative of current practice and user needs. Emission limits are specified by national and international standards bodies. Emission limits for the most part are regulated and hence controlled, which is the case in the U.S. and Canada. Such regulatory limits take precedence, even if the limits are different from those considered in this document. For product immunity, while in some parts of the world this is regulated, for the U.S. and Canada, it is not regulated except for some types of safety equipment. In this way, adequate immunity is more a quality aspect of the product because it does not operate in its intended RF environment, the user would deem it of poor design and quality. The immunity test levels described in this document are representative of common levels applied internationally. However, severe environments (in which levels of electromagnetic disturbance are high) require the consideration of applying higher test levels. This consideration is described in this recommended practice. Finally, it should be noted that the entire recommended practice does not contain normative requirements, as such practices remain optional.

Keywords: ambient noise levels, ANSI C63.12, atmospheric noise, electromagnetic compatibility (EMC), emissions, galactic noise, immunity, limits, man-made noise, test levels

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Introduction

This introduction is not part of ANSI C63.12-2015, American National Standard Recommended Practice for Electromagnetic Compatibility Limits and Test Levels.

The problem of electromagnetic compatibility has existed from the early days of radio when spark gaps were used for transmitting and receivers picked up many signals unintentionally. Radio transmission has evolved from those early days into a highly sophisticated science. However, the need for compatibility is even greater today than it was in earlier times since modern society has come to depend on radio waves in all facets of life, from garage door openers and licensed broadcasting to sophisticated airplane and missile guidance systems. The proliferation of unintentional radiators, such as personal computers and video games, has increased the need for electromagnetic compatibility. However, severe environments (high levels) require the consideration of applying high test levels, which are described in this recommended practice. Finally, it should be noted that the entire document does not contain normative requirements as such practices remain optional.

The need for an electromagnetic compatibility document was recognized by the American National Standards Committee C63, and as a result, the first official issue of ANSI C63.12 was approved 2 December 1983 and published by IEEE in 1984. Changes in national and international standards since that time prompted Committee C63 to request that Subcommittee 1 undertake a first revision, which was published by IEEE in 1988. Further changes in international and military immunity techniques and requirements, as well as requests by potential users of ANSI C63.12, led to the 2007 reaffirmation revision.

C63® Subcommittee 3 and the main C63® committee believed it was time to fully review the document and come up with additions and changes to bring the 2007 edition in line with current practices. For this edition, the following significant changes were made:

a) The addition of a more current list of definitions and references, especially those focusing on immunity measurements, that is most useful in understanding ANSI C63.12. The bibliography was also changed with the addition of more current documents.

b) "Immunity" was substituted for "susceptibility" where statements such as "product was more susceptible" was changed to "product had less immunity," which has the same meaning. The preferred use of "immunity" matches present international usage in published immunity standards where "susceptible" is not used at all.

   NOTE—The U.S. Department of Defense continues to use the term "susceptibility" in their EMC standards, and it is used as the lack of "immunity."

c) For more universal applicability, emission limits are identified for Class A and Class B environments and not residential, commercial, light industrial, or industrial. Corresponding examples are given such as typically a Class B environment is residential and a Class A environment is industrial or commercial.

d) For emission measurements, more reliance is made on the techniques in ANSI C63.4, including reference to antenna calibration methods contained in ANSI C63.5.

e) Clarification is made on stating emission limits and immunity test levels, as it is up to the user to use test levels for product performance. Emission limits are regulated and thus are not voluntary.

f) Updated ambient radio noise curves from ITU-R have been added. They cover maximum and minimum of atmospheric noise, galactic noise, and noise in various environments. These include man-made noise at RF quiet sites and in city areas.

g) Updated the recommended generic immunity test levels.

This recommended practice suggests emission limits based on maintaining existing ambient levels and protection of licensed radio services. Immunity limits are based on ensuring satisfactory equipment operation in the presence of likely disturbance levels due to man-made and natural noise sources.

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1. Overview

Over the years, electromagnetic compatibility (EMC) measurement and control standards have been developed for use by industry and testing organizations. Many of these standards apply to particular classes of products such as radio/TV receivers, intentional transmitters, and incidental radiation products with internal microprocessors.

1.1 Scope

This recommended practice presents a rationale for developing emission limits and immunity test levels and recommends that these facets are representative of current practice and user needs. Emission limits generally are written by national and international standards bodies. Emission limits for the most part are specified by regulators, which is the case in the U.S. and Canada. Such regulatory limits take precedence, even if the limits are different from those considered in this document. In the U.S. and Canada, product immunity is not regulated except for some safety equipment. In this way, adequate immunity is more a quality aspect of the product as if it does not operate in its intended RF environment, the user would deem it of poor quality. It should be noted that the entire document does not impose normative requirements, but recommends options.

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