IEEE STANDARDS ASSOCIATION

IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Transmission and Distribution Facilities

IEEE Power and Energy Society

Sponsored by the

Substations Committee

and the

Transmission and Distribution Committee

IEEE
3 Park Avenue
New York, NY 10016-5997
USA

IEEE Std 1613.1™-2013

IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Transmission and Distribution Facilities

Sponsor
Substations Committee

Co-Sponsor
Transmission and Distribution Committee

of the

IEEE Power and Energy Society

Approved 11 December 2013

IEEE-SA Standards Board

Abstract: Environmental testing requirements are defined for communications networking devices to be installed in transmission and distribution facilities. This standard establishes a common reproducible basis for designing and evaluating devices utilizing radio frequency (RF) up to 6 GHz, power line communications, and broadband over power line (BPL) technologies. It also requires immunity to five IEC electromagnetic compatibility standards for which there are no IEEE equivalent standards. This standard is an extension to IEEE Std 1613™-2009 and IEEE Std 1613a™-2011.

Keywords: common-mode disturbances, communications networking device, conducted RF, damped oscillatory magnetic fields, IEEE 1613.1™, immunity, power frequency magnetic fields, radiated, RFI hazards, surge

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

PDF: ISBN 978-0-7381-8752-5 STD98457
Print: ISBN 978-0-7381-8753-2 STDPD98457

Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading "Important Notice" or "Important Notices and Disclaimers Concerning IEEE Standards Documents."

Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents (standards, recommended practices, and guides), both full-use and trial-use, are developed within IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association ("IEEE-SA") Standards Board. IEEE ("the Institute") develops its standards through a consensus development process, approved by the American National Standards Institute ("ANSI"), which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, IEEE disclaims any and all conditions relating to: results; and workmanlike effort. IEEE standards documents are supplied "AS IS" and "WITH ALL FAULTS."

Use of an IEEE standard is wholly voluntary. The existence of an IEEE standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE should be considered the approved IEEE standard.

Official statements

A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, or be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE. However, IEEE does not provide consulting information or advice pertaining to IEEE Standards documents. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to comments or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in revisions to an IEEE standard is welcome to join the relevant IEEE working group.

Comments on standards should be submitted to the following address:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854 USA

Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

Photocopies

Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every ten years. When a document is more than ten years old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE standard.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit the IEEE-SA Website at http://ieeexplore.ieee.org/xpl/standards.jsp or contact IEEE at the address listed previously. For more information about the IEEE-SA or IEEE's standards development process, visit the IEEE-SA Website at http://standards.ieee.org.

Errata

Errata, if any, for all IEEE standards can be accessed on the IEEE-SA Website at the following URL: http://standards.ieee.org/findstds/errata/index.html. Users are encouraged to check this URL for errata periodically.

Patents

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE-SA Website at http://standards.ieee.org/about/sasb/patcom/patents.html. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

Participants

At the time this draft standard was completed, the PES Substations C2 Working Group had the following membership:

John Tengdin, *Co-Chair*
G. Larry Clark, *Co-Chair*
Gerald Ramie, *Vice Chair*
Krista Gluchoski, Secretary

John Banting
James Bougie
Didier Chan-Foy
Bui Dac-phoue
Michael J. Dood
Ron Farquharson
Richard Harada
Chris Huntley
Marc Lacroix
Alex Lee
Brian Mugalian
Jay Murphy
Daniel Nordell
Arnold Offner
Craig Preuss
Mark Simon
Tyler Stinson
Eric Thibodeau
Jian-Chang Tan

The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

William Ackerman
Saleman Alibhay
John Banting
Paul Barnhart
Philip Beaumont
Robert Beresh
Oscar Bolado
James Bougie
Gustavo Brunello
William Byrd
Thomas Callsen
Paul Cardinal
Didier Chan-Foy
Suresh Channarasappa
Robert Christman
Stephen Conrad
Randall Crellin
Michael J. Dood
John Egan
Kenneth Fodero
Fredric Friend
Jalal Gohari
Stephen Grier
Randall Groves
Roger Hedding
Jeffrey Helzer
Lee Herron
Gary Heuston
Werner Hoelzl
Yi Hu
Chris Huntley
Noriyuki Ikeuchi
Gael Kennedy
Yuri Khersonsky
Jim Kulchisky
Marc Lacroix
Chung-Yiu Lam
Thomas McCarthy
William Mccoy
John McDonald
Jose Morales
Brian Mugalian
Jerry Murphy
R. Murphy
Bruce Muschlitz
Michael Newman
Joe Nims
Gary Nissen
Lorraine Padden
Bansi Patel
Percy Pool
Craig Preuss
Farnoosh Rahmatian
Michael Roberts
Charles Rogers
Benjamin Rolfe
Thomas Rozek
Sergio Santos
Bartien Sayogo
Dennis Schlender
Thomas Schossig
Devki Sharma
Mark Simon
Veselin Skendzic
Jerry Smith
John Spare
Gary Stoedter
Gary Stuebing
John Tengdin
Joe Uchiyama
Eric Udren
Benton Vandiver
John Vergis
Jane Verner
James Wilson
Daidi Zhong
Sergio Zimath

When the IEEE-SA Standards Board approved this standard on 11 December 2013, it had the following membership:

John Kulick, *Chair*
David J. Law, *Vice Chair*
Richard H. Hulett, *Past Chair*
Konstantinos Karachalios, *Secretary*

Masayuki Ariyoshi
Peter Balma
Farooq Bari
Ted Burse
Wael William Diab
Stephen Dukes
Jean-Philippe Faure
Alexander Gelman
Mark Halpin
Gary Hoffman
Paul Houzé
Jim Hughes
Michael Janezic
Joseph L. Koepfinger*
Oleg Logvinov
Ron Petersen
Gary Robinson
Jon Walter Rosdahl
Adrian Stephens
Peter Sutherland
Yatin Trivedi
Phil Winston
Yu Yuan

*Member Emeritus

Also included are the following nonvoting IEEE-SA Standards Board liaisons:

Richard DeBlasio, *DOE Representative*
Michael Janezic, *NIST Representative*

Catherine Berger
Senior Program Manager, IEEE-SA Content Publishing

Erin Spiewak
Program Manager, IEEE-SA Technical Community

Introduction

This introduction is not part of IEEE Std 1613.1-2013, IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Transmission and Distribution Facilities.

This document is an extension of IEEE Std 1613™-2009 and its amendment (IEEE Std 1613a™-2011) from two perspectives. The scope has been broadened to include devices installed in all electric power facilities, not just substations, and includes the communications modules installed in Smart Meters. It adds two installation zones—(Zone A) inside a facility's building/control house or fenced area, and (Zone B) outside these buildings or fenced areas. Thus, it is expressly applicable for devices used for distribution automation and distributed generation. Added are the device testing and performance requirements for communications via radio frequency (RF), via power line carrier/communications, via Broadband over Power Line (BPL), or via Ethernet cable. Five IEC immunity tests have also been added as suggested in the SGIP-EMI Issues White paper [B5][a] with specific immunity levels for Zone A and Zone B installations. The test conditions and acceptance criteria in Annex A have been revised to help ensure that the transmit function of the device is exposed to the test conditions at some point during the tests in Clause 5 through Clause 12. This is a new requirement in this text, and may not be a requirement in other standards.

The requirements in Clause 6 of IEEE Std 1613-2009 regarding the application of the fast transient (EFT) test waveform for transverse mode testing of a device's input/output circuits have been deleted. Transverse mode testing for EFT is only required on dc power supply terminals rated 48 volts or above. Other than these changes and the reduced test levels in Zone B, all the remaining requirements in IEEE Std 1613-2009 are unchanged, and are applicable to IEEE 1613.1 devices. The reverse is also true—a device in compliance with IEEE Std 1613.1 also meets these remaining requirements in IEEE Std 1613-2009.

[a] The numbers in brackets correspond to those of the bibliography in Annex B.

Contents

IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Transmission and Distribution Facilities

1. Overview

1.1 Scope

This standard establishes the requirements for communications networking devices supporting electric transmission and distribution inside/outside an electric power substation. It addresses issues such as equipment enclosures, temperature ranges, electrical phenomena, and others that are characterized by a transmission and distribution environment. This includes the different communication methods used in these locations, such as wireless and power line carrier/communications.