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IEEE Recommended Practice for Inductive Coordination of Electric Supply and Communication Lines

IEEE Power and Energy Society

Sponsored by the
Power System Communications and Cybersecurity Committee

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USA

IEEE Std 776™-2018
(Revision of
IEEE Std 776-1992)

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IEEE Recommended Practice for Inductive Coordination of Electric Supply and Communication Lines

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Approved 5 December 2018

IEEE-SA Standards Board

Abstract: The inductive environment that exists in the vicinity of electric power and wire-line telecommunications systems and the interfering effects that may be produced are addressed. An interface that permits either party, without need to involve the other, to verify the induction at the interface by use of a probe wire is presented. This recommended practice does not apply to railway signal circuits.

Keywords: communication lines, electric supply, IEEE 776™, inductive coordination

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

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Introduction

This introduction is not part of IEEE Std 776-2018, IEEE Recommended Practice for Inductive Coordination of Electric Supply and Communication Lines.

Since the publication of joint reports of the National Electric Light Association (which became the Edison Electric Institute in 1933) and the Bell Telephone System during and following the 1920s, the joint responsibility of inductive coordination between power and telecommunication companies has generally been accepted. See Joint Subcommittee reports for additional information [B13][1]. However, the need has long been recognized for one document that defines the components of interference, provides specific procedures to predict levels of interference, provides specific methods to demonstrate cause and effect relationships, and defines a threshold for initiating coordination to mitigate interference. The Longitudinal Induction Working Group, which is under the direction of the Inductive Coordination and Electrical Protection (ICEP) Subcommittee of the Transmission Systems Committee of the Communications Society, has struggled to produce a fair and equitable approach to fill this need under the leadership of three different chairs. These chairs were, first, Harold C. Held, retired from Illinois Bell Telephone Company; second, the late James R. Wilson, formerly affiliated with South Central Bell Telephone Company; and third, David Lee Boneau of Southwestern Bell Telephone Company. Major contributions to the document were made by James R. Wilson, George Benz of Southern New England Telephone Company, and David Boneau. Members of the Oklahoma Power and Communications Association (originally the Oklahoma Inductive Coordination Association) furthered the development of the document by field testing and assuring the validity of the various calculations and measurement techniques (see Boneau [B3]). Many others have reviewed and helped to formulate a guide that is usable by both power and telecommunication company personnel. However, this Recommended Practice does not apply to railway signal circuits (which are outside the scope of the Sponsor), at the request of contributors from the railway industry to the original standard.

After publication of IEEE Std 776™-1987, the guide provided a useful tool for those faced with inductive coordination problems. Questions arose about the stringent harmonic distribution used on the probe-wire interface described in Table 4 and Table 5. IEEE Std 776-1987 provided flexibility in the use of harmonic distributions in Table 4 and Table 5 to match the variety of existing environments and conditions. The general section was also rewritten in an effort to make it more understandable. Other sections were also improved editorially. These efforts and contributions were made by Dick Nelson, Harold Held, Bill McCoy, Charlie Nelson, Chrys Chrysanthou, and David Boneau.

The Longitudinal Induction Working Group dissolved in early 1996 with the majority of its members moving over to the Wire-Line Subcommittee. On October of 1996 the responsibility for this Recommended Practice was officially transferred from the TransAccess/ICEP Committee to the Power Systems Communication Committee's Wire-Line Subcommittee (under the Power Engineering Society). In 2017, the Wire-Line Subcommittee decided to revise this Recommended Practice to bring it in line with the latest IEEE-SA Style Manual and to make several editorial revisions to clarify the content.

In addition, because many noise specialists and subject matter experts have either retired or left the telecommunications industry in the recent past, the Wire-Line Subcommittee decided to include information on Harmonic Analysis in Annex D as well as activities on noise reduction investigations as Annex C in IEEE Std 1137™-2018. Those activities are to be conducted prior to implementing the procedures outlined in this Recommended Practice. The information contained in Annex C of IEEE Std 1137-2018 may be considered a handy reference for those persons that have replaced the specialists that have left or are new to the field of inductive coordination or noise investigations.

[1] The numbers in brackets correspond to those of the bibliography in Annex A.

Contents

IEEE Recommended Practice for Inductive Coordination of Electric Supply and Communication Lines

1. Scope

This recommended practice addresses the inductive environment that exists in the vicinity of electric power and wire-line telecommunications systems and the interfering effect that may be produced thereby; guidance is offered for the control or modification of the environment and the susceptibility of the affected systems in order to maintain an acceptable level of interference. An acceptable level is defined as an amount of steady-state or surge induced longitudinal voltage or current that does not cause a personnel or public safety hazard, damage to cable or equipment, and/or circuit degradation or failure.

To aid the user of this recommended practice in calculating induction between power and telecommunication lines, the concept of an interface is developed. This recommended practice permits either party, without need to involve the other, to verify the induction at the interface by use of a probe wire. This recommended practice does not apply to railway signal circuits.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

IEEE Std 81™, IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.[1,2]

IEEE Std 367™, IEEE Recommended Practice for Determining the Electric Power Station Ground Potential Rise and Induced Voltage from a Power Fault.

IEEE Std 487™, IEEE Standard for the Electrical Protection of Communications Facilities Serving Electric Supply Locations—General Considerations.

IEEE Std 820™, IEEE Standard Telephone Loop Performance Characteristics.

IEEE Std 1137™, IEEE Recommended Practice for the Implementation of Inductive Coordination Mitigation Techniques and Applications.

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