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Spectrum Management and Telecommunications

Interference-Causing Equipment Standard

Alternating Current High Voltage Power Systems

Note: On June 24, 2013, a minor correction was made to Section 6.1.

Preface

This Interference-Causing Equipment Standard ICES-004, Issue 4, *Alternating Current High Voltage Power Systems*, replaces ICES-004, Issue 3, published December 2001.

This document will be in force as of the publication date of Notice SMSE-005-13 in the *Canada Gazette*, Part I. Upon publication, the public has 120 days to submit comments. Comments received will be taken into account in the preparation of the next version of the document.

List of Changes:

1. Clarification on the scope of the standard
2. General reformatting of the standard

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Issued under the authority of
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1. Introduction

The purpose of this document is to set out the technical requirements for alternating high voltage power systems. It is also meant to advise concerned parties of the technical criteria upon which determinations regarding harmful interference complaints involving such interference-causing equipment will generally be based, should it be necessary for the Minister to intercede in the resolution of an interference problem. It does not in any way limit the scope of the Minister's powers under the Radiocommunication Act, nor should it be interpreted as restricting the extent of the “matters that the Minister considers relevant” to strictly technical matters.

The Radiocommunication Act provides enabling powers to the Minister beyond those previously applicable under the Radio Act. Specifically, subparagraph 5(1)(l) states, in part, that:

“.... the Minister may, taking into account all matters that the Minister considers relevant for ensuring the orderly establishment or modification of radio stations and the orderly development and efficient operation of radiocommunication in Canada, [...] make determinations as to the existence of harmful interference and issue orders to persons in possession or control of radio apparatus, interference-causing equipment or radio-sensitive equipment that the Minister determines to be responsible for the harmful interference to cease or modify operation of the apparatus or equipment until such time as it can be operated without causing or being affected by harmful interference.”

These powers permit the Minister to make determinations regarding harmful interference complaints involving interference-causing equipment and radio apparatus and to issue orders to resolve them.

2. Scope

This Interference-Causing Equipment Standard sets out the limits and methods of measurement for alternating current high power systems. The determination of harmful interference from radio noise produced by alternating current high voltage power systems will be based on the limits defined in Section 6.3 of this document.

Sections 4 to 6 apply to all alternating current high voltage power systems.

3. Exemptions

This document does not apply to:

- (a) underground power systems;
- (b) radio noise associated with power line carrier current transmissions;
- (c) high voltage direct current components of a power system in which the design for the construction of the direct current components of the system was initiated before January 1, 1991.

4. Normative Reference

This standard refers to the CAN/CSA-CISPR publication. Where such reference is made, it shall be to the following edition: CAN/CSA-CISPR 16-1-1-10.¹

Measurements shall be taken with a CISPR (International Special Committee on Radio Interferences) type radio frequency receiver that is designed and calibrated in accordance with Section 4 of CAN/CSA-CISPR 16-1-1-10.

5. Definitions

The following definitions apply in this standard:

Alternating current high voltage power system or power system means any generating station, substation or power line, or any combination thereof, that is operated under common management for the generation, transmission or distribution of alternating current electric power.

CISPR means the International Special Committee on Radio Interference, which is part of the International Electrotechnical Commission (IEC).

Distribution line means an overhead power line that operates at nominal phase-to-phase voltages from 1 kV to 75 kV.

Distribution substation means a substation at which all power lines entering or leaving the substation are distribution lines.

Fair weather means weather conditions that are absent of rain, snow and/or fog within 10 km of the measuring location. For the conditions to be considered fair weather, insulators and conductors must be completely dry.

Power line means a transmission line or a distribution line; “power system owner” means the person who owns, possesses or controls a power system; “substation” means an assemblage of equipment — including switches, circuit breakers, buses, transformers and control devices — for the purpose of switching power circuits or transforming electric power from one voltage to another.

Tap line means a transmission line that is less than 10 km long and that forms an addition or extension to an existing transmission line.

Transmission line means an overhead power line that operates at nominal phase-to-phase voltages from 76 kV to 800 kV.

Transmission substation means a substation where at least one of the power lines entering the substation is a transmission line.

¹ CAN/CSA-CISPR 16-1-1-10, *Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus*, is available online at <http://shop.csa.ca/en/canada/electromagnetic-compatibility-emc/canca-cispr-16-1-1-10/invt/27031062010>.

6. Requirements

6.1 Instrumentation

Instrumentation shall be in accordance with the publication referred to in Section 4. The radio frequency receiver shall be connected to a calibrated rod or calibrated loop antenna.

6.2 Method of Measurement

6.2.1 General Requirements for Transmission Lines and Substations

The following section outlines the general requirements when measuring radio noise produced by transmission lines and substations of alternating current high voltage power systems.

- The radiated noise shall be measured in fair weather.
- The frequency range from 0.15 MHz to 30 MHz shall be scanned and the values corrected, as specified later in this section (see subsection 6.2.4), to ensure that there are no noise peaks exceeding the limits at any frequency.
- The loop antenna shall be rotated to the position that produces the maximum reading on the meter of the radio frequency receiver.

6.2.2 Measurement Procedures for Transmission Lines

The radiated noise shall be measured at points located near both ends as well as near the middle of the transmission line, and each of those points shall be:

- at least 5 km from any transmission substation wherever possible;
- at a sufficient distance from any metal fences or other reflecting objects as well as from any intersections with other power lines or communications lines in order to minimize the effects of any such objects/lines on the measurements; and
- at a distance of 15 m from the vertical plane containing the nearest conductor or, where the measurement cannot be taken at a distance of 15 m, at the nearest convenient distance.

The antenna shall be placed along a horizontal axis that is in a plane perpendicular to the transmission line at the centre of a span.

6.2.3 Measurement Procedures for Transmission Substations

The radiated noise shall be measured along each of any two adjacent sides of the transmission substation, and each of those measurements shall be taken at a sufficient distance from power lines and communication lines in order to minimize the effects of such lines on the measurements.

The antenna for the radio frequency receiver shall be placed:

- at a point of maximum intensity of noise, as determined by preliminary rough measurements; and

- at a distance of 15 m from the property limit of the transmission substation or, where the measurement cannot be taken at a distance of 15 m, at the nearest convenient distance.

6.2.4 Use of Correction Factors

Where measurements cannot be made at a lateral distance of 15 m, measurements shall be taken:

- at the nearest convenient distance and corrected to 15 m, using the curves of Figure 1 (shown below); or
- at distances that are either greater or less than 15 m, using interpolation to determine the correct reading for a distance of 15 m.

All measured values shall be corrected to a reference frequency using Figure 2 (shown later in this section), with a reference frequency of 0.5 MHz.

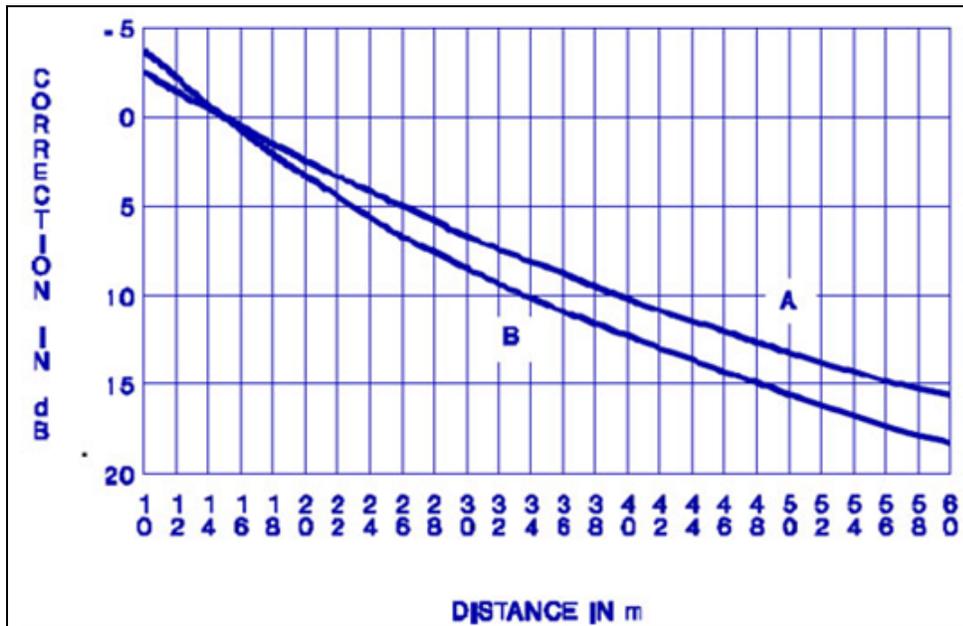


Figure 1: Correction factor for lateral distances other than 15 metres

Note:

- A = This value represents the transmission line (or the transmission substation) with the lowest conductor that is 15 metres above ground
- B = This value represents the transmission line (or the transmission substation) with the lowest conductor that is 9 metres above ground;
- The abscissa represents the lateral distance from the nearest conductor or from the substation boundary in metres; and
- The ordinate represents the correction factor to be added to the measured value.

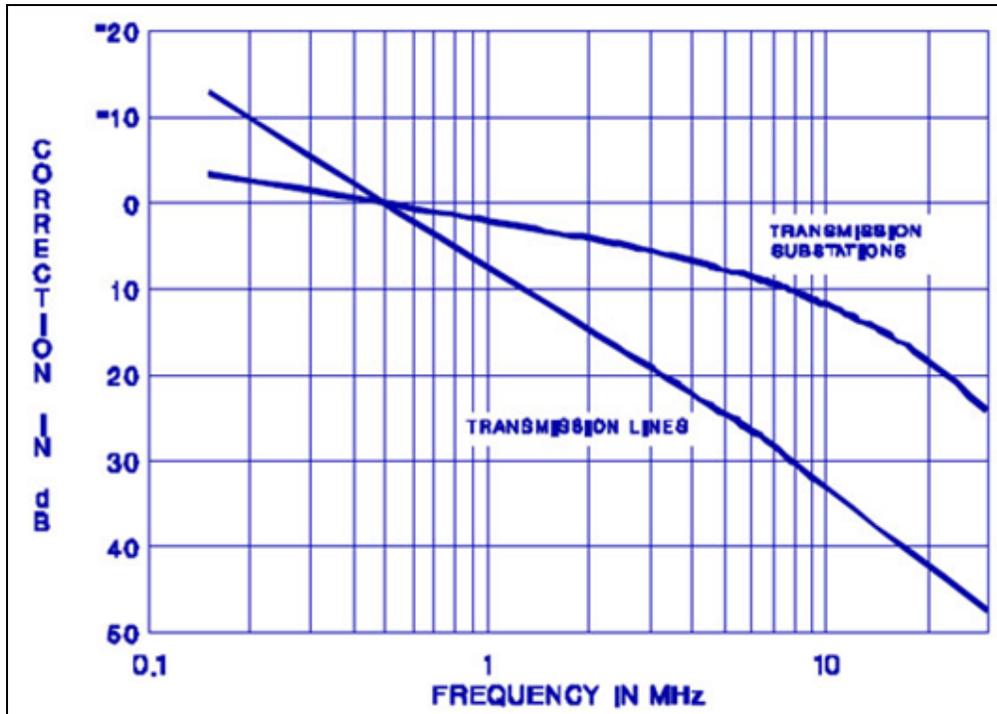


Figure 2: Correction factor for frequencies other than 0.5 MHz (to be added to the measured value)

6.3 Limits

6.3.1 Radiated Noise Limits for Transmission Lines and Transmission Substations

The maximum radiated noise that may be produced in the frequency band from 0.15 MHz to 30 MHz by a transmission line or a transmission substation in fair weather, as measured and corrected in accordance with Section 6.2, shall not exceed the values set out in Table 1.

In the case of transmission substations where nominal phase-to-phase voltages fall within two or more of the ranges set out in Table 1, the limits for radiated noise with respect to the highest nominal phase-to-phase voltage range shall apply.

Table 1: Maximum field intensity of radio noise produced by transmission lines and transmission substations in the frequency range 0.15 to 30 megahertz

Range of nominal phase-to-phase voltage (kV)	Radio noise field intensity limits at a lateral distance of 15 m (dB μ V/m)
76-200	49
201-300	53
301-400	56
401-600	60
601-800	63

6.3.2 Radiated Noise Limits for Distribution Lines and Distribution Substations

- (1) Subject to clause 2 of this subsection, no limit applies to the emissions of radiated radio noise from a distribution line or a distribution substation.
- (2) Where the radiated radio noise from a distribution line or a distribution substation causes interference to the reception of:
 - a Canadian broadcasting signal in the MF band that measures at least 54 dB μ V/m at the receiver suffering interference, or
 - any signal that is received in the performance of any other radio service,

the radiated noise shall be limited to the level at which the interference is eliminated.

7. Determination of Harmful Interference

Operators of interference-causing equipment should be aware that even when they comply with all requirements of the *Radiocommunication Act*, the *Radiocommunication Regulations* and this technical standard, operators should take all practical steps to minimize the likelihood of interference occurrences.

The Department will not normally respond to a request from a complainant to make a formal determination of harmful interference, unless it can be demonstrated that all other reasonable courses of action to resolve the problem have been explored. Industry Canada fully expects complainants and operators of interference-causing equipment to cooperate with one another in order to resolve possible interference issues.

As a last resort, the Department may decide to make a determination of harmful interference. When the Minister is called upon for the determination of harmful interference, the operator of the allegedly interference-causing equipment may be required to submit a record of the measurements and the results of such equipment to the Minister for examination. If the transmission line, the transmission substation, the distribution line or the distribution substation is found to cause harmful interference to radiocommunication, the operator of the interference-causing equipment shall immediately take corrective action. The Minister's determination of cause will be based upon the values of field strength shown in the Table 1 and clause 2 of subsection 6.3.2.