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REDLINE VERSION

colour inside

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

Radio interference characteristics of overhead power lines and high-voltage equipment –
Part 1: Description of phenomena

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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FOREWORD

This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

CISPR 18-1, which is a technical report, has been prepared by CISPR subcommittee B: Interference relating to industrial, scientific and medical radio-frequency apparatus, to other (heavy) industrial equipment, to overhead power lines, to high voltage equipment and to electric traction.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) updated description of the RF characteristics of spark discharges which might contain spectral radio noise components up to the GHz frequency range;
b) addition of state of the art in HVDC converter technology

The text of this technical report is based on the following documents:

DTR	Report on voting
CIS/B/653/DTR	CIS/B/674/RVDTR

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the CISPR 18 series can be found, under the general title *Radio interference characteristics of overhead power lines and high-voltage equipment,* on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This Technical Report is the first of a three-part series dealing with radio noise generated by electrical power transmission and distribution facilities (overhead lines and substations). It contains information in relation of the physical phenomena involved in the generation of electromagnetic noise fields. It also includes a description of the main properties of such fields and their numerical values. Its content was adjusted such as to allow for use of the lateral distance *y* for the establishment of standard profiles for the lateral radio noise field emanating from HV overhead power lines.

The technical data given in this Part 1 of the CISPR 18 series are intended to be a useful aid to overhead line designers and also to anyone concerned with checking the radio noise performance of a line to ensure satisfactory protection of wanted radio signals. The data should facilitate the use of the recommendations given in its Parts 2 and 3 dealing with

– methods of measurement and procedures for determining limits, and a
– code of practice for minimizing the generation of radio noise.

The CISPR 18 series does not deal with biological effects on living matter or any issues related to exposure to electromagnetic fields.

This document has been prepared in order to provide information on the many factors involved in protecting the reception of radio, especially (but not limited to) analogue television, and digital terrestrial television broadcasting, hereafter denominated as digital television broadcasting, from interference due to background noise generated by AC and DC high voltage overhead power lines, distribution lines, and associated equipment. The information given should be of assistance when means of avoiding or abating radio noise are being considered.

Information is mainly given on the generation and characteristics of radio noise from AC power lines and equipment operating at 1 kV and above, in the frequency ranges 0,15 MHz to 30 MHz (a.m. sound broadcasting), 30 MHz to 300 MHz (f.m. sound broadcasting, analogue television broadcasting) and in the range 470 MHz to 950 MHz (digital television broadcasting). The special aspect of spark discharges due to bad contacts or defects is taken into account. Information is also given on interference due to DC overhead power lines for which corona and interference conditions are different from those of AC power lines. The radio broadcast services mentioned above are examples only and the information in this document relates, in a technology-neutral way, to protection of radio reception in general, for the given frequency ranges.

The general procedure for establishing the limits of the radio noise from overhead power lines and associated equipment is given, together with typical values as examples, and methods of measurement.

The clause on limits for conductor corona, which may occur in normal operation of power lines, concentrates on the low frequency and medium frequency bands as it is only in these bands where ample evidence, based on established practice, is available. Examples of limits to protect radio reception in the frequency band 30 MHz to 300 MHz are not given, as measuring methods and certain other aspects of the problems in this band have not yet been fully resolved. Site measurements and service experience have shown that levels of noise from power lines generated by conductor corona at frequencies higher than 300 MHz are so low that interference is unlikely to be caused to analogue television reception.

Presently, there are no limits for radio noise due to spark discharges, which may occur at bad contacts or on the surface of polluted insulators, to protect radio reception in the UHF band (around 470 MHz to 950 MHz) for digital television broadcasting. The characteristics of spark discharges in the UHF band are not fully understood yet. Furthermore, digital television systems employ error-correction functions, and the true effects of spark discharges to image quality are consequently not quite known.

The values of limits given as examples are calculated to provide a reasonable degree of protection to the reception of e.g. radio broadcasting at the edges of the recognized service areas of the appropriate transmitters in the a.m. radio frequency bands, in the least favourable conditions likely to be generally encountered. These limits are intended to provide guidance at the planning stage of the line and national standards or other specifications against which the performance of the line may be checked after construction and during its useful life.

Recommendations are made on the design, routing, construction and maintenance of the lines and equipment forming part of the power distribution system to minimize interference and it is hoped that this document will aid other radio services in the consideration of the problems of interference.

RADIO INTERFERENCE CHARACTERISTICS OF OVERHEAD POWER LINES AND HIGH-VOLTAGE EQUIPMENT –

Part 1: Description of phenomena

1 Scope

This part of CISPR 18, which is a Technical Report, applies to radio noise from overhead power lines, associated equipment, and high-voltage equipment which may cause interference to radio reception. The scope of this document includes the causes, measurement and effects of radio interference, design aspects in relation to this interference, methods and examples for establishing limits and prediction of tolerable levels of interference from high voltage overhead power lines and associated equipment, to the reception of radio ~~broadcast~~ signals and services.

The frequency range covered is 0,15 MHz to ~~300 MHz~~ 3 GHz.

Radio frequency interference caused by the pantograph of overhead railway traction systems is not considered in this document.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

CISPR 16-1-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR TR 18-2~~:2010~~ __[1], *Radio interference characteristics of overhead power lines and high-voltage equipment – Part 2: Methods of measurement and procedure for determining limits*

ISO IEC Guide 99, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

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1 Under preparation. Stage at the time of publication: CISPR/RPUB 18-2:2017.

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TECHNICAL REPORT

colour inside

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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CISPR TR 18-1:2017-10(en)

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FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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