



TECHNICAL REPORT



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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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	2
1 Scope.....	9
2 Normative references	9
3 Terms and definitions	9
4 Radio noise from HV AC overhead power lines.....	10
4.1 General.....	10
4.2 Physical aspects of radio noise	11
4.2.1 Mechanism of formation of a noise field.....	11
4.2.2 Definition of noise.....	13
4.2.3 Influence of external parameters.....	14
4.3 Main characteristics of the noise field resulting from conductor corona	14
4.3.1 General	14
4.3.2 Frequency spectrum	14
4.3.3 Lateral profile	15
4.3.4 Statistical distribution with varying seasons and weather conditions	17
5 Effects of corona from conductors	18
5.1 Physical aspects of corona from conductors	18
5.1.1 General	18
5.1.2 Factors in corona generation	19
5.2 Methods of investigation of corona by cages and test lines	20
5.2.1 General	20
5.2.2 Test cages.....	20
5.2.3 Test lines.....	21
5.3 Methods of predetermination.....	22
5.3.1 General	22
5.3.2 Analytical methods	22
5.3.3 CIGRÉ method	22
5.4 Catalogue of standard profiles	23
5.4.1 General	23
5.4.2 Principle of catalogue presentation	23
6 Radio noise levels due to insulators, hardware and substation equipment (excluding bad contacts).....	25
6.1 Physical aspects of radio noise sources.....	25
6.1.1 General	25
6.1.2 Radio noise due to corona discharges at hardware.....	25
6.1.3 Radio noise due to insulators.....	25
6.2 Correlation between radio noise voltage and the corresponding field strength for distributed and individual sources	27
6.2.1 General	27
6.2.2 Semi-empirical approach and equation	27
6.2.3 Analytical methods	29
6.2.4 Example of application.....	30
6.3 Influence of ambient conditions.....	30
7 Sparking due to bad contacts	30
7.1 Physical aspects of the radio noise phenomenon	30

7.2	Example of gap sources.....	32
8	Special d.c. effects Radio noise from HVDC overhead power lines	32
8.1	General [56, 57].....	32
8.1.1	Description of electric field physical phenomena of HVDC transmission systems.....	32
8.1.2	Description of radio interference phenomena of HVDC transmission system.....	33
8.2	Effects of corona from conductors Physical aspects of DC corona	34
8.3	Formation mechanism of a noise field from a DC line.....	34
8.4	Characteristics of the radio noise from DC lines.....	35
8.4.1	General	35
8.4.2	Frequency spectrum	35
8.4.3	Lateral profile	35
8.4.4	Statistical distribution	35
8.5	Factors influencing the radio noise from DC lines	36
8.5.1	General	36
8.5.2	Conductor surface conditions.....	36
8.5.3	Conductor surface gradient.....	37
8.5.4	Polarity.....	37
8.5.5	Weather conditions	37
8.5.6	Subjective effects	39
8.6	Calculation of the radio noise level due to conductor corona.....	39
8.7	Radio noise due to insulators, hardware and substation equipment.....	41
8.8	Valve firing effects	41
9	Figures	32
	Annex A (informative) Calculation of the voltage gradient at the surface of a conductor of an overhead line	55
	Annex B (informative) Catalogue of profiles of radio noise field due to conductor corona for certain types of power line	59
	Annex C (informative) Summary of the catalogue of radio noise profiles according to the recommendations of the CISPR	75
	Bibliography.....	77
	Figure 1 – Typical lateral attenuation curves for high voltage lines, normalized to a lateral distance of $y_0 = 15$ m, distance in linear scale	43
	Figure 2 – Typical lateral attenuation curves for high voltage lines, normalized to a direct distance of $D_0 = 20$ m, distance in logarithmic scale	44
	Figure 3 – Examples of statistical yearly distributions of radio-noise levels recorded continuously under various overhead lines.....	45
	Figure 4 – Examples of statistical yearly distributions of radio-noise levels recorded continuously under various overhead lines.....	46
	Figure 5 – Example of statistical yearly distributions of radio-noise levels recorded continuously under various overhead lines.....	47
	Figure 6 – Examples of statistical yearly distributions of radio-noise levels recorded continuously under various overhead lines.....	48
	Figure 7 – Equipotential lines for clean and dry insulation units	49
	Figure 8 – Determination of the magnetic field strength from a perpendicular to a section of a line, at a distance x from the point of injection of noise current I	49
	Figure 9 – Longitudinal noise attenuation versus distance from noise source (from test results of various experiments frequencies around 0,5 MHz).....	50

Figure 10 – Lateral profile of the radio noise field strength produced by distributed discrete sources on a 420 kV line of infinite length.....	51
Figure 11 – Impulsive radio-noise train of gap-type discharges	52
Figure 12 – Example of relative strength of radio noise field as a function of frequency below 1 GHz using QP detector	52
Figure 13 – Example of relative strength of radio noise field due to gap discharge as a function of frequency 200 MHz to 3 GHz using peak detector	53
Figure 14 – Example of relative strength of radio noise field as a function of the distance from the line.....	53
Figure 15 – Unipolar and bipolar space charge regions of a HVDC transmission line	54
Figure 16 – The corona current and radio interference field	54
Figure B.1 – Triangular formation (1)	60
Figure B.2 – Triangular formation (2)	61
Figure B.3 – Flat formation	62
Figure B.4 – Arched formation	63
Figure B.5 – Flat wide formation	64
Figure B.6 – Vertical formation (480 (Rail) X 4B)	65
Figure B.7 – Flat formation	66
Figure B.8 – Flat formation	67
Figure B.9 – Arched formation	68
Figure B.10 – Flat formation	69
Figure B.11 – Arched formation	70
Figure B.12 – Flat formation	71
Figure B.13 – Vertical formation (480 (Cardinal) X 6B).....	72
Figure B.14 – Typical frequency spectra for the radio noise fields of high voltage power lines	73
Figure B.15 – Prediction of radio noise level of a transmission line for various types of weather	74
Figure C.1 – Examples of transformations of the profiles of Figures B.1 to B.13 using the direct distance of 20 m as reference	76
Table B.1 – List of profiles	59
Table C.1 – Radio noise profiles	75

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OF OVERHEAD POWER LINES AND
HIGH-VOLTAGE EQUIPMENT –**

Part 1: Description of phenomena

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This redline version of the official IEC Standard allows the user to identify the changes made to the 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".

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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)*

NOTE Informative references are listed in the Bibliography.

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

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	9
2 Normative references	9
3 Terms and definitions	9
4 Radio noise from HV AC overhead power lines.....	10
4.1 General.....	10
4.2 Physical aspects of radio noise	11
4.2.1 Mechanism of formation of a noise field.....	11
4.2.2 Definition of noise.....	13
4.2.3 Influence of external parameters.....	14
4.3 Main characteristics of the noise field resulting from conductor corona	14
4.3.1 General	14
4.3.2 Frequency spectrum	14
4.3.3 Lateral profile	15
4.3.4 Statistical distribution with varying seasons and weather conditions	17
5 Effects of corona from conductors	18
5.1 Physical aspects of corona from conductors	18
5.1.1 General	18
5.1.2 Factors in corona generation	19
5.2 Methods of investigation of corona by cages and test lines	20
5.2.1 General	20
5.2.2 Test cages.....	20
5.2.3 Test lines.....	21
5.3 Methods of predetermination.....	21
5.3.1 General	21
5.3.2 Analytical methods	22
5.3.3 CIGRÉ method	22
5.4 Catalogue of standard profiles	23
5.4.1 General	23
5.4.2 Principle of catalogue presentation	23
6 Radio noise levels due to insulators, hardware and substation equipment (excluding bad contacts).....	24
6.1 Physical aspects of radio noise sources.....	24
6.1.1 General	24
6.1.2 Radio noise due to corona discharges at hardware.....	25
6.1.3 Radio noise due to insulators.....	25
6.2 Correlation between radio noise voltage and the corresponding field strength for distributed and individual sources	26
6.2.1 General	26
6.2.2 Semi-empirical approach and equation	27
6.2.3 Analytical methods	29
6.2.4 Example of application.....	29
6.3 Influence of ambient conditions.....	30
7 Sparking due to bad contacts	30
7.1 Physical aspects of the radio noise phenomenon	30

7.2	Example of gap sources.....	31
8	Radio noise from HVDC overhead power lines.....	32
8.1	General [56, 57].....	32
8.1.1	Description of electric field physical phenomena of HVDC transmission systems.....	32
8.1.2	Description of radio interference phenomena of HVDC transmission system.....	33
8.2	Physical aspects of DC corona.....	33
8.3	Formation mechanism of a noise field from a DC line.....	34
8.4	Characteristics of the radio noise from DC lines.....	34
8.4.1	General.....	34
8.4.2	Frequency spectrum.....	34
8.4.3	Lateral profile.....	35
8.4.4	Statistical distribution.....	35
8.5	Factors influencing the radio noise from DC lines.....	35
8.5.1	General.....	35
8.5.2	Conductor surface conditions.....	36
8.5.3	Conductor surface gradient.....	36
8.5.4	Polarity.....	37
8.5.5	Weather conditions.....	37
8.5.6	Subjective effects.....	38
8.6	Calculation of the radio noise level due to conductor corona.....	38
8.7	Radio noise due to insulators, hardware and substation equipment.....	40
8.8	Valve firing effects.....	40
9	Figures.....	42
	Annex A (informative) Calculation of the voltage gradient at the surface of a conductor of an overhead line.....	54
	Annex B (informative) Catalogue of profiles of radio noise field due to conductor corona for certain types of power line.....	58
	Annex C (informative) Summary of the catalogue of radio noise profiles according to the recommendations of the CISPR.....	74
	Bibliography.....	76
	Figure 1 – Typical lateral attenuation curves for high voltage lines, normalized to a lateral distance of $y_0 = 15$ m, distance in linear scale.....	42
	Figure 2 – Typical lateral attenuation curves for high voltage lines, normalized to a direct distance of $D_0 = 20$ m, distance in logarithmic scale.....	43
	Figure 3 – Examples of statistical yearly distributions of radio-noise levels recorded continuously under various overhead lines.....	44
	Figure 4 – Examples of statistical yearly distributions of radio-noise levels recorded continuously under various overhead lines.....	45
	Figure 5 – Example of statistical yearly distributions of radio-noise levels recorded continuously under various overhead lines.....	46
	Figure 6 – Examples of statistical yearly distributions of radio-noise levels recorded continuously under various overhead lines.....	47
	Figure 7 – Equipotential lines for clean and dry insulation units.....	48
	Figure 8 – Determination of the magnetic field strength from a perpendicular to a section of a line, at a distance x from the point of injection of noise current I	48
	Figure 9 – Longitudinal noise attenuation versus distance from noise source (from test results of various experiments frequencies around 0,5 MHz).....	49

Figure 10 – Lateral profile of the radio noise field strength produced by distributed discrete sources on a 420 kV line of infinite length.....	50
Figure 11 – Impulsive radio-noise train of gap-type discharges	51
Figure 12 – Example of relative strength of radio noise field as a function of frequency below 1 GHz using QP detector	51
Figure 13 – Example of relative strength of radio noise field due to gap discharge as a function of frequency 200 MHz to 3 GHz using peak detector	52
Figure 14 – Example of relative strength of radio noise field as a function of the distance from the line.....	52
Figure 15 – Unipolar and bipolar space charge regions of a HVDC transmission line	53
Figure 16 – The corona current and radio interference field	53
Figure B.1 – Triangular formation (1)	59
Figure B.2 – Triangular formation (2)	60
Figure B.3 – Flat formation	61
Figure B.4 – Arched formation	62
Figure B.5 – Flat wide formation	63
Figure B.6 – Vertical formation (480 (Rail) X 4B)	64
Figure B.7 – Flat formation	65
Figure B.8 – Flat formation	66
Figure B.9 – Arched formation	67
Figure B.10 – Flat formation	68
Figure B.11 – Arched formation	69
Figure B.12 – Flat formation	70
Figure B.13 – Vertical formation (480 (Cardinal) X 6B).....	71
Figure B.14 – Typical frequency spectra for the radio noise fields of high voltage power lines	72
Figure B.15 – Prediction of radio noise level of a transmission line for various types of weather	73
Figure C.1 – Examples of transformations of the profiles of Figures B.1 to B.13 using the direct distance of 20 m as reference	75
Table B.1 – List of profiles	58
Table C.1 – Radio noise profiles	74

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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 signals and services.

The frequency range covered is 0,15 MHz to 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:___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)*

NOTE Informative references are listed in the Bibliography.

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