

TECHNICAL REPORT



Electromagnetic performance of high voltage direct current (HVDC) overhead transmission lines

INTERNATIONAL
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CONTENTS

FOREWORD	6
INTRODUCTION	8
1 Scope	9
2 Normative references	9
3 Terms and definitions	9
4 Electric field and ion current	10
4.1 Description of the physical phenomena	10
4.2 Calculation methods	14
4.2.1 General	14
4.2.2 Semi-analytic method	15
4.2.3 Finite element method	17
4.2.4 BPA method	18
4.2.5 Empirical methods of EPRI	18
4.2.6 Recent progress	19
4.3 Experimental data	20
4.3.1 General	20
4.3.2 Instrumentation and measurement methods	20
4.3.3 Experimental results for electric field and ion current	22
4.3.4 Discussion	22
4.4 Implication for human and nature	23
4.4.1 General	23
4.4.2 Static electric field	23
4.4.3 Research on space charge	24
4.4.4 Scientific review	29
4.5 Design practice of different countries	31
5 Magnetic field	32
5.1 Description of physical phenomena	32
5.2 Magnetic field of HVDC transmission lines	32
6 Radio interference	33
6.1 Description of radio interference phenomena of HVDC transmission system	33
6.1.1 General	33
6.1.2 Physical aspects of DC corona	33
6.1.3 Mechanism of formation of a noise field of DC line	34
6.1.4 Characteristics of radio interference from DC line	34
6.1.5 Factors influencing the RI from DC line	35
6.2 Calculation methods	37
6.2.1 EPRI empirical formula	37
6.2.2 IREQ empirical method	38
6.2.3 CISPR bipolar line RI prediction formula	39
6.3 Experimental data	40
6.3.1 Measurement apparatus and methods	40
6.3.2 Experimental results for radio interference	40
6.4 Criteria of different countries	40
7 Audible noise	41
7.1 Basic principles of audible noise	41

7.2	Description of physical phenomena.....	43
7.2.1	General	43
7.2.2	Lateral profiles.....	44
7.2.3	Statistical distribution	47
7.2.4	Influencing factors	48
7.2.5	Effect of altitude above sea level	50
7.2.6	Concluding remarks	50
7.3	Calculation methods	50
7.3.1	General	50
7.3.2	Theoretical analysis of audible noise propagation	50
7.3.3	Empirical formulas of audible noise	51
7.3.4	Semi-empirical formulas of audible noise	52
7.3.5	Concluding remarks	55
7.4	Experimental data	55
7.4.1	Measurement techniques and instrumentation	55
7.4.2	Experimental results for audible noise	55
7.5	Design practice of different countries	56
7.5.1	General	56
7.5.2	The effect of audible noise on people	56
7.5.3	The audible noise level and induced complaints	56
7.5.4	Limit values of audible noise of HVDC transmission lines in different countries	60
7.5.5	General national noise limits	60
Annex A (informative)	Experimental results for electric field and ion current.....	62
A.1	Bonneville Power Administration ± 500 kV HVDC transmission line.....	62
A.2	FURNAS ± 600 kV HVDC transmission line.....	62
A.3	Manitoba Hydro ± 450 kV HVDC transmission line	63
A.4	Hydro-Québec – New England ± 450 kV HVDC transmission line	65
A.5	IREQ test line study of ± 450 kV HVDC line configuration	66
A.6	HVTRC test line study of ± 400 kV HVDC line configuration	67
A.7	Test study in China	68
Annex B (informative)	Experimental results for radio interference	71
B.1	Bonneville power administration's 1 100 kV direct current test project.....	71
B.1.1	General	71
B.1.2	Lateral profile	71
B.1.3	Influence of conductor gradient.....	72
B.1.4	Percent cumulative distribution	73
B.1.5	Influence of wind	75
B.1.6	Spectrum	75
B.2	Hydro-Québec institute of research	77
B.2.1	General	77
B.2.2	Cumulative distribution	77
B.2.3	Spectrum	78
B.2.4	Lateral profiles.....	78
B.3	DC lines of China	79
Annex C (informative)	Experimental results for audible noise	82
Bibliography		86

Figure 1 – Monopolar and bipolar space charge regions of an HVDC transmission line [1]....	11
Figure 2 – Lateral profile of magnetic field on the ground of ± 800 kV HVDC lines	33
Figure 3 – The corona current I and radio interference magnetic field H	34
Figure 4 – RI tolerance tests: reception quality as a function of signal-to-noise ratio.....	41
Figure 5 – Attenuation of different weighting networks used in audible-noise measurements [16]	42
Figure 6 – Comparison of typical audible noise frequency spectra [131].....	44
Figure 7 – Lateral profiles of the AN	45
Figure 8 – Lateral profiles of the AN from a bipolar HVDC-line equipped with $8 \times 4,6$ cm ($8 \times 1,8$ in) conductor bundles energized with $\pm 1\,050$ kV [133]	45
Figure 9 – Lateral profiles of fair-weather A-weighted sound level [131].....	46
Figure 10 – All weather distribution of AN and RI at +15 m lateral distance of the positive pole from the upgraded Pacific NW/SW HVDC Intertie [34]	47
Figure 11 – Statistical distributions of fair weather A-weighted sound level measured at 27 m lateral distance from the line center during spring 1980.....	48
Figure 12 – Audible noise complaint guidelines [14] in USA	57
Figure 13 – Measured lateral profile of audible noise on a 330 kV AC transmission line [151]	57
Figure 14 – Subjective evaluation of DC transmission line audible noise; EPRI test center study 1974 [14]	58
Figure 15 – Subjective evaluation of DC transmission line audible noise; OSU study 1975 [14]	58
Figure 16 – Results of the operators' subjective evaluation of AN from HVDC lines	59
Figure 17 – Results of subjective evaluation of AN from DC lines	59
Figure A.1 – Electric field and ion current distributions for Manitoba Hydro ± 450 kV Line [39]	64
Figure A.2 – Cumulative distribution of electric field for Manitoba Hydro ± 450 kV Line [39] ...	64
Figure A.3 – Cumulative distribution of ion current density for Manitoba Hydro ± 450 kV line [39]	65
Figure A.4 – Test result for total electric field at different humidity [119]	69
Figure A.5 – Comparison between the calculation result and test result for the total electric field (minimum conductor height is 18 m) [119]	70
Figure B.1 – Connection for 3-section DC test line [123]	71
Figure B.2 – Typical RI lateral profile at ± 600 kV, $4 \times 30,5$ mm conductor, 11,2 m pole spacing, 15,2 m average height [14]	72
Figure B.3 – Simultaneous RI lateral, midspan, in clear weather and light wind for three configurations, bipolar ± 400 kV [123]	72
Figure B.4 – RI at 0,834 MHz as a function of bipolar line voltage $4 \times 30,5$ mm conductor, 11,2 m pole spacing, 15,2 m average height.....	73
Figure B.5 – Percent cumulative distribution for fair weather, 2×46 mm, 18,3 m pole spacing, ± 600 kV	73
Figure B.6 – Percent cumulative distribution for rainy weather, 2×46 mm, 18,3 m pole spacing, ± 600 kV	74
Figure B.7 – Percent cumulative distribution for fair weather, $4 \times 30,5$ mm, 13,2 m pole spacing, ± 600 kV	74
Figure B.8 – Percent cumulative distribution for rainy weather, $4 \times 30,5$ mm, 13,2 m pole spacing, ± 600 kV.....	75
Figure B.9 – Radio interference frequency spectrum	76

Figure B.10 – RI vs. frequency at ± 400 kV [123]	76
Figure B.11 – Cumulative distribution of RI measured at 15 m from the positive pole [124] ...	77
Figure B.12 – Conducted RI frequency spectrum measured with the line terminated at one end [124].....	78
Figure B.13 – Lateral profile of RI [124]	79
Figure B.14 – Comparison between calculation result and test result for RI lateral profile [119]	80
Figure B.15 – The curve with altitude of the RI on positive reduced-scale test lines	81
Figure C.1 – Examples of statistical distributions of fair weather audible noise. dB(A) measured at 27 m from line center of a bipolar HVDC test line [16].....	83
Figure C.2 – AN under the positive polar test lines varying with altitude.....	85
Table 1 – Electric field and ion current limits of ± 800 kV DC lines in China	31
Table 2 – Electric field limits of DC lines in United States of America [121]	31
Table 3 – Electric field and ion current limits of DC lines in Canada	31
Table 4 – Electric field limits of DC lines in Brazil	31
Table 5 – Parameters of the IREQ excitation function (Monopolar) [122].....	39
Table 6 – Parameters of the IREQ excitation function (Bipolar) [122]	39
Table 7 – Parameters defining regression equation for generated acoustic power density [8].....	54
Table 8 – Typical sound attenuation (in decibels) provided by buildings [157]	61
Table A.1 – BPA ± 500 kV line: statistical summary of all-weather ground-level electric field intensity and ion current density [34]	62
Table A.2 – FURNAS ± 600 kV line: statistical summary of ground-level electric field intensity and ion current density [38].....	63
Table A.3 – Hydro-Québec–New England ± 450 kV HVDC transmission line. Bath, NH; 1990-1992 (fair weather), 1992 (rain), All-season measurements of static electric E-field in kV/m [41]	66
Table A.4 – Hydro-Québec – New England ± 450 kV HVDC Transmission Line. Bath, NH; 1990-1992, All-season fair-weather measurements of ion concentrations in kions/cm ³ [41]	66
Table A.5 – IREQ ± 450 kV test line: statistical summary of ground-level electric field intensity and ion current density [43].....	67
Table A.6 – HVTRC ± 400 kV test line: statistical summary of peak electric field and ion currents [44]	68
Table A.7 – Statistical results for the test data of total electric field at ground (50 % value) [119].....	69
Table B.1 – Influence of wind on RI	75
Table B.2 – Statistical representation of the long term RI performance of the tested conductor bundle [124]	78
Table B.3 – RI at 0,5 MHz at lateral 20 m from positive pole (fair weather)	79
Table B.4 – The parameters of test lines.....	80
Table B.5 – Measured results of 0,5 MHz RI for the full-scale test lines at different altitudes.....	81
Table C.1 – Audible Noise Levels of HVDC Lines according to [121] and [152]	84
Table C.2 – Test results of 50 % AN statistics for full-scale test lines.....	85

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROMAGNETIC PERFORMANCE OF HIGH VOLTAGE DIRECT
CURRENT (HVDC) OVERHEAD TRANSMISSION LINES**

FOREWORD

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IEC TR 62681 has been prepared by IEC technical committee 115: High Voltage Direct Current (HVDC) transmission for DC voltages above 100 kV. It is a Technical Report.

This second edition cancels and replaces the first edition, published in 2014. This edition constitutes a technical revision.

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

- a) the limits of total electric field in some countries have been supplemented and improved;
- b) the definition of 80 %/80 % criteria of radio interference has been clarified;
- c) a table has been added for bipolar excitation which shows the parameters of the IREQ radio interference excitation function;
- d) the clause of CEPRI research results of audible noise has been deleted;
- e) the clause of main conclusion of audible noise has been deleted.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
115/289/DTR	115/292/RVDTR

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

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

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INTRODUCTION

Electric fields and magnetic fields are produced in the vicinity of a High Voltage Direct Current (HVDC) overhead transmission line. When the electric field at the conductor surface exceeds a critical value, known as the corona onset gradient, positive or negative free charges leave the conductor and interact with the surrounding air and ionization takes place in the layer of surrounding air, leading to the formation of corona discharges. The corona discharge will result in corona loss but also change the electro-magnetic properties around the HVDC overhead transmission lines.

The parameters used to describe the electromagnetic performance of an HVDC overhead transmission line mainly include the:

- 1) electric field,
- 2) ion current,
- 3) magnetic field,
- 4) radio interference,
- 5) audible noise.

To control these parameters in a reasonable and acceptable range, for years, a great deal of theoretical and experimental research was conducted in many countries, and relevant national standards or enterprise standards were developed. This document collects and records the status of study and progress of electric fields, ion current, magnetic fields, radio interference, and audible noise of HVDC overhead transmission lines. It is recognised that general technical discussion given in this document would be applicable for HVDC sub-stations as well; However, since layout of a station differs very differently, expressions given for HVDC overhead transmission line cannot be directly used as many assumptions would not hold good. Furthermore, an HVDC sub-station is not accessible to the general public, thus the numbers and limits given in this document are not applicable for HVDC sub-stations.

ELECTROMAGNETIC PERFORMANCE OF HIGH VOLTAGE DIRECT CURRENT (HVDC) OVERHEAD TRANSMISSION LINES

1 Scope

This document provides general guidance on the electromagnetic environment issues of HVDC overhead transmission lines. It concerns the major parameters adopted to describe the electromagnetic properties of an HVDC overhead transmission line, including electric fields, ion current, magnetic fields, radio interference, and audible noise generated as a consequence of such effects. If the evaluation method and/or criteria of electromagnetic properties are not yet regulated, engineers in different countries can refer to this document to:

- support/guide the electromagnetic design of HVDC overhead transmission lines,
- limit the influence on the environment within acceptable ranges, and
- optimize engineering costs.

2 Normative references

There are no normative references in this document.