BS EN 50121-3-1:2017

BSI Standards Publication

Railway applications — Electromagnetic compatibility

Part 3-1: Rolling stock — Train and complete vehicle

bsi.

National foreword

This British Standard is the UK implementation of EN 50121-3-1:2017. It supersedes BS EN 50121-3-1:2015 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/9, Railway Electrotechnical Applications.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2017

ISBN 978 0 580 94101 6

ICS 29.280; 33.100.01; 45.060.01

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2017.

Amendments/Corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50121-3-1

January 2017

ICS 33.100.01; 45.060.01; 45.140

Supersedes EN 50121-3-1:2015

English Version

Railway applications - Electromagnetic compatibility - Part 3-1: Rolling stock - Train and complete vehicle

Applications ferroviaires - Compatibilité électromagnétique - Partie 3-1: Matériel roulant - Trains et véhicules complets

Bahnanwendungen - Elektromagnetische Verträglichkeit - Teil 3-1: Bahnfahrzeuge - Zug und gesamtes Fahrzeug

This European Standard was approved by CENELEC on 2016-10-24. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

This document (EN 50121-3-1:2017) has been prepared by CLC/TC 9X: “Electrical and electronic applications for railways”.

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2017-10-24
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2019-10-24

This document supersedes EN 50121-3-1:2015.

EN 50121-3-1:2016 includes the following significant technical changes with respect to EN 50121-3-1:2015:

— clarification of scope (Clause 1);

— set dated normative references (Clause 2);

— clarification of definition (Clause 3);

— clarification of applicability (Clause 4);

— clarification of interference on outside party telecommunication lines (6.2), psophometric current (Annex A).

— moving emission values for radiated H-field in the frequency range 9 kHz to 150 kHz into new Annex C due to the fact that:

  a) there are very few outside world victims (e.g. radio services);

  b) the radiated emission measured at 10m is not representative to the compatibility with internal railway apparatus;

  c) the EMC with other railway apparatus in this frequency range is covered in other procedures and standards like the EN 50238 series;

  d) there is low reproduceability;

— editorial corrections in the European foreword, the Scope and Annex A.

— revision of Annex ZZ.

This European Standard is to be read in conjunction with EN 50121-1.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive.

For the relationship with EU Directive see informative Annex ZZ, which is an integral part of this document.

This standard forms Part 3-1 of the EN 50121 series published under the general title “Railway applications - Electromagnetic compatibility”. The series consists of:

— Part 1: *General;*

— Part 2: *Emission of the whole railway system to the outside world;*

— Part 3-1: *Rolling stock - Train and complete vehicle;*

— Part 3-2: *Rolling stock – Apparatus;*

— Part 4: *Emission and immunity of the signalling and telecommunications apparatus;*

— Part 5: *Emission and immunity of fixed power supply installations and apparatus.*

Introduction

High power electronic equipment, together with low power microcontrollers and other electronic devices, are being installed on trains in great numbers. Electromagnetic compatibility has therefore become a critical issue for the design of train-related apparatus as well as of the train as a whole.

This Product Standard for rolling stock sets limits for electromagnetic emission and immunity in order to ensure a well functioning system within its intended environment.

Immunity limits are not given for the complete vehicle. EN 50121-3-2 defines requirements for the apparatus installed in the rolling stock, since it is impractical to test the complete unit. An EMC plan includes equipment covered by this standard.

1 Scope

This European Standard specifies the emission and immunity requirements for all types of rolling stock. It covers traction stock, hauled stock and trainsets including urban vehicles for use in city streets. This European standard specifies the emission limits of the rolling stock to the outside world.

The scope of this part of the standard ends at the interface of the rolling stock with its respective energy inputs and outputs. In the case of locomotives, trainsets, trams etc., this is the current collector (pantograph, shoe gear). In the case of hauled stock, this is the AC or DC auxiliary power connector. However, since the current collector is part of the traction stock, it is not entirely possible to exclude the effects of this interface with the power supply line. The slow moving test has been designed to minimize these effects.

There may be additional compatibility requirements within the railway system identified in the EMC plan (e.g. as specified in EN 50238).

Basically, all apparatus to be integrated into a vehicle meet the requirements of EN 50121-3-2. In exceptional cases, where apparatus meets another EMC Standard, but full compliance with EN 50121-3-2 is not demonstrated, EMC is ensured by adequate integration measures of the apparatus into the vehicle system and/or by an appropriate EMC analysis and test which justifies deviating from EN 50121-3-2.

Electromagnetic interference concerning the railway system as a whole is dealt with in EN 50121-2.

These specific provisions are to be used in conjunction with the general provisions in EN 50121-1.

The frequency range considered is from 0 Hz (DC) to 400 GHz. No measurements need to be performed at frequencies where no requirement is specified.

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

EN 50121-2:2017, *Railway applications - Electromagnetic compatibility - Part 2: Emission of the whole railway system to the outside world*

EN 55016-1-1:2010+A2:2014, *Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus (CISPR 16-1-1:2010)*

EN 50121-1:2017, *Railway applications - Electromagnetic compatibility - Part 1: General*

EN 50121-3-2:2016, *Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock - Apparatus*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
traction stock
electric and diesel locomotive, high speed trainset, elementary fixed combination of traction stock and hauled stock, electric and diesel multiple unit (no locomotive, distributed traction equipment), Light Railway Vehicle (LRV) such as tram, trolley bus or any other electrical vehicle for urban mass transit, underground trainset

3.1.2
hauled stock
independent passenger coaches and freight wagons (if they contain electric apparatus such as freezing equipment) which may be hauled in random combinations by different types of locomotives

3.1.3
main line vehicle
vehicle such as high speed train, suburban train, freight train, mainly designed to operate between cities

3.1.4
urban vehicle
vehicle such as underground trainset, tram, LRV (Light Rail Vehicle), trolleybus, mainly designed to operate within the boundary of a city

3.2 Abbreviations

AC	Alternating current
bw	Band width
DC	Direct current
E	Electric (field)
EMC	Electromagnetic compatibility
EUT	Equipment under test
H	Magnetic (field)
ISDN	Integrated Services Digital Network
ITU-T	International Telegraph Union – Telecommunication Standardization Sector
LRV	Light Rail Vehicle
PCM	Pulse – code modulation
QC	Quadrant converters
QP	Quasi-Peak
xDSL	all types of ***d****igital* ***s****ubscriber* ***l****ines*

4 Applicability

Generally, it is not possible to test electromagnetic compatibility invoking every function of the rolling stock. The tests shall be made at typical operating modes considered to produce the largest emission.

The typical operating mode shall require all systems to be energised which are normally in continuous operation during service. It is not necessary during the test to exercise systems which operate transiently such as for example operation of internal doors, although they should be energised. It is not necessary to test degraded modes of operation.

The configuration and mode of operation shall be specified in the test plan and the actual conditions during the tests shall be precisely noted in the test report.

5 Immunity requirements

No tests are applied to the complete vehicle. It is expected that the assembly of the apparatus into a complete vehicle will give adequate immunity, provided that an EMC plan has been prepared and implemented, taking into account the requirements in EN 50121-3-2.

6 Emission tests and limits

6.1 General

The emission tests and limits for rolling stock in this standard should ensure as far as possible that the rolling stock does not interfere with typical installations in the vicinity of the railway system.

Measurements shall be performed in well-defined and reproducible conditions. It is not possible to totally separate the effects of the railway system and the stock under test. For radiated emissions, the test conditions are defined in 6.3.1 and 6.3.2.

NOTE 1 Signalling and communication, train radio and other railway systems (axle counters, track circuits, train control systems, etc.) are different in every country in terms of operating frequencies and waveforms. Therefore, compatibility requirements are specified according to the type of signalling and communication systems used (see e.g. EN 50238 series).

NOTE 2 There may be cases in which radio or other railway external services with working frequencies below 150 kHz are in operation close to the railway. The EMC management plan covers these cases and an adequate level of emission from the railway on these working frequencies may be found in the values given in informative Annex C hence no guarantee can be given for an undisturbed operation.

6.2 Interference on outside party telecommunication lines

6.2.1 Digital telecommunication lines

Interference with digital systems such as PCM, ISDN, xDSL are not covered in this European Standard.

NOTE It should be noted that these systems operate in a higher frequency range using multiple carriers and various automatic error correction protocols.

It is considered unlikely that rolling stock can produce sufficient interference in this frequency range.

6.2.2 Analogue telecommunication lines

No harmonized limits apply.

Information about interference on telecommunication lines can be found in Annex A.

6.3 Radiated electromagnetic disturbances

6.3.1 Test site

It can be assumed, that measurements will not take place in laboratory conditions. Trees, walls, bridges, tunnels or other conductive objects in the vicinity of the measurement antenna could have an impact on the measurement. Other railway vehicles operating in the same feeding section or nearby the measuring point may affect the measurement result. Overhead/third rail discontinuities as well as substations, power lines, buried lines, transformers, neutral sections, section insulators etc. close to the measuring point may cause additional variations.

These influences shall be reduced as far as practical but in any case no obstacles above rail level which may influence the measurements shall be located between antenna and EUT.

The overhead/third rail should be a continuous line as far as practical on both sides of the measurement point (typically at least 200 m).

Since it is impossible to avoid the support masts of the overhead, the measurement point shall be at the midpoint between masts, on the opposite side of the track (in case of a double track, on the side of the track which is being used). If the railway system is powered by a third rail, the antenna shall be on the same side of the track (worst case).

Since resonances may occur in the overhead line at radio-frequencies, it may be necessary to change the test site. The exact location of the test site and features of both the site and the overhead system layout shall be noted.

The contribution of the substation may be considered when assessing the emissions from the vehicle. Note that the contribution of a DC substation depends on its load current and will not be measured properly in a no-load condition.

At the beginning and at the end of the test series the ambient noise shall be recorded. This measurement shall be done without any influence of the vehicle.

If at specific frequencies or in specific frequency ranges the ambient noise is higher than the limit values less 6 dB, the measurements at these frequencies need not be considered. These frequencies shall be noted in the test report.

NOTE It may be helpful to perform this ambient noise measurement also with the vehicle completely powered down in front of the antenna.

6.3.2 Test conditions

The tests shall cover the operation of all systems onboard the rolling stock which may produce radiated emissions.

Hauled stock (a representative version) shall be tested while stationary in an energised mode (auxiliary converters, battery chargers, etc. in operation). The antenna should be sited opposite the equipment expected to produce the greatest emissions at the frequencies under measurement.

Tests for identical coaches or wagons are performed only once.

Traction stock shall be tested while stationary and at slow moving speed. During the stationary test, the auxiliary converters shall operate (it is not inevitably under maximum load conditions that the maximum emission level is produced) and the traction converters shall be under voltage but not operating. The antenna shall be in front of the middle of each vehicle unless an alternative location is expected to produce higher emission levels.

For the slow moving test, the speed shall be low enough to avoid arcing at or bouncing of the sliding contact and high enough to allow for electric braking. The recommended speed range is (20 ± 5) km/h for urban vehicles and (50 ± 10) km/h for main line vehicles. When passing the antenna, the vehicle shall accelerate or decelerate with approximately 1/3 of its maximum tractive effort within the given speed range.

The slow moving test may be replaced by a stationary test with the vehicle operating at 1/3 of its maximum tractive effort against the mechanical brakes, if the following conditions are fulfilled:

— the traction equipment can be operated while the vehicle is stationary;

— tests of electric braking are not required, if no different circuits are used in braking.

If the slow moving test is replaced by a stationary test with tractive effort, then the slow moving limits shall be applied.

Any vehicles using onboard energy storage for traction shall use the test procedure and limits for slow moving test for the charging process.

NOTE Slow moving test procedure and limits are used for the charging process (for traction energy storing devices) because it has a short duration with high energy transfer.

6.3.3 Emission limits

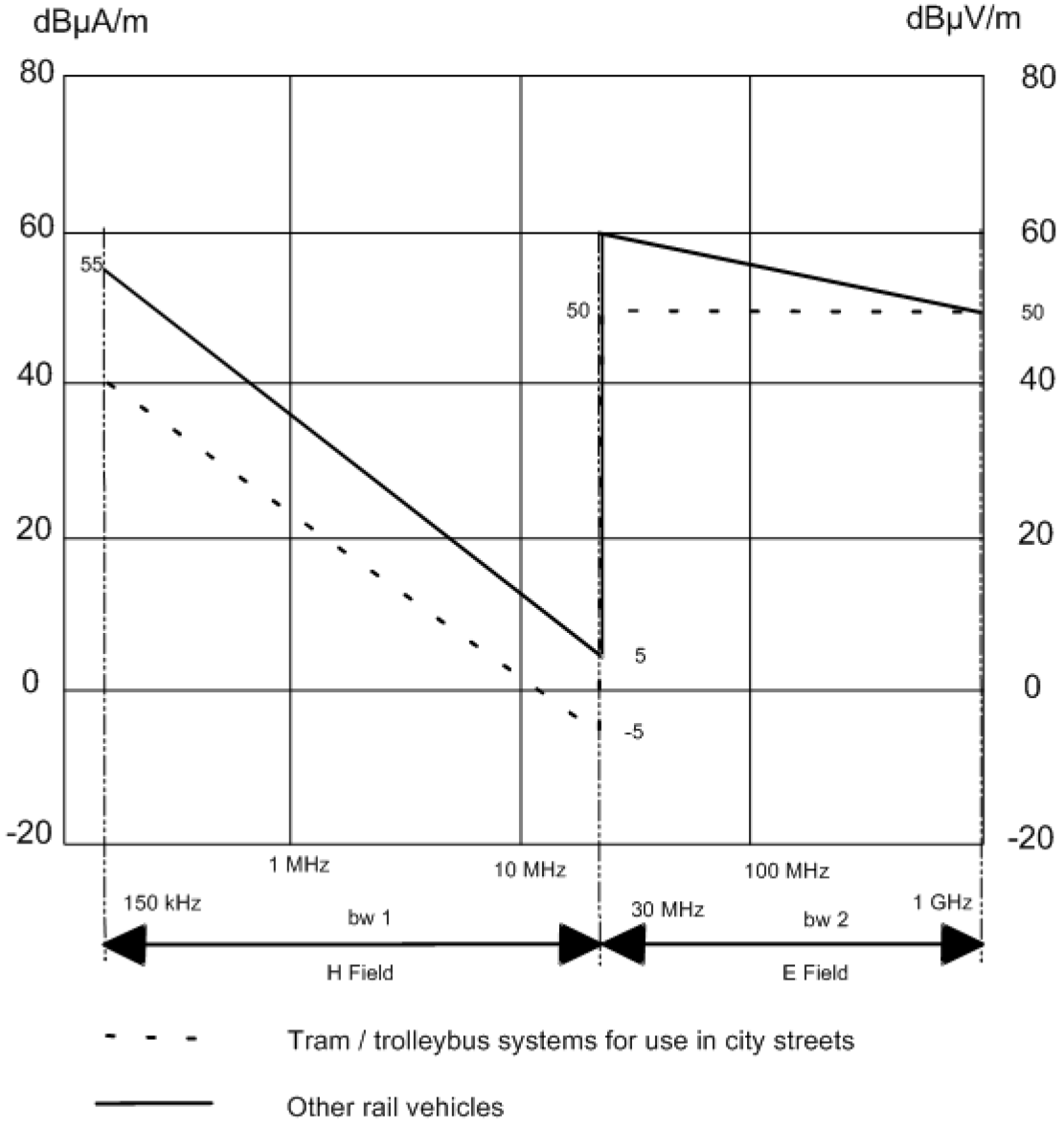

Figure 1 — Limits for stationary test (QP, 10 m)

The limits are defined as quasi-peak values and the bandwidths are those used in EN 55016-1-1:

	Bandwidth
Frequencies from 150 kHz to 30 MHz	9 kHz (bw 1)
Frequencies from 30 MHz to 1 GHz	120 kHz (bw 2)

All values are measured at a distance of 10 m from the centre of the track.

The emission limits are specified up to 1 GHz due to the fact that there are no significant sources of interference above 1GHz and that emissions from microprocessor controlled equipment which may give rise to emissions at frequencies greater than 1 GHz are addressed by compliance with EN 50121-3-2.

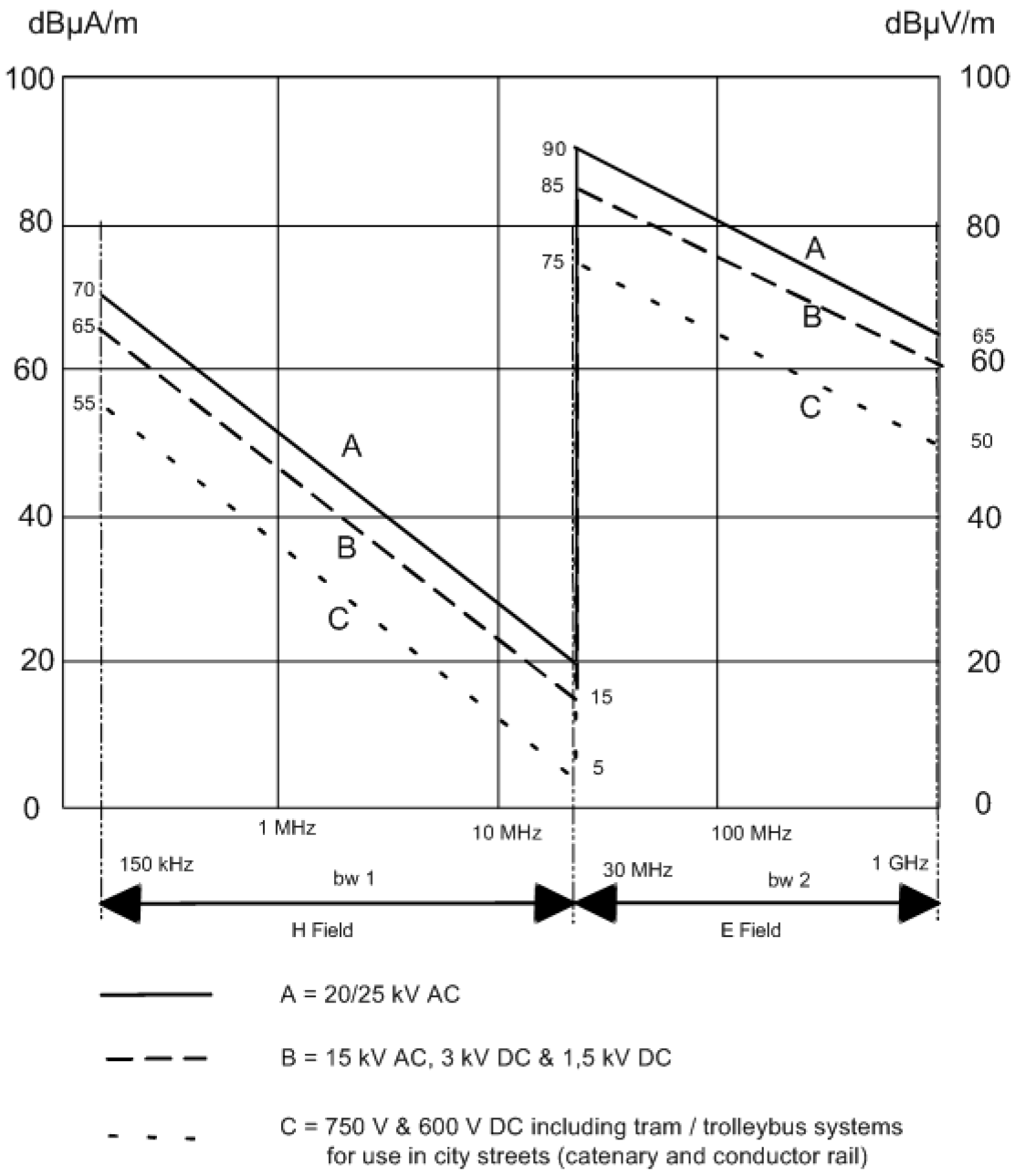

Figure 2 — Limits for slow moving test (Peak, 10 m)

For details of test procedure, see Annex B.

All values measured at a distance of 10 m from the centre of the track in peak values.

For diesel and diesel electric locomotives and multiple units, the emission limits of Figure 1 (“other rail vehicles”) and B in Figure 2 shall apply unless specific measures dictate otherwise (e.g. usage in lower voltage electrified lines).

The emission limits are specified up to 1 GHz due to the fact that there are no significant sources of interference above 1GHz and that emissions from microprocessor controlled equipment which may give rise to emissions at frequencies greater than 1 GHz are addressed by compliance with EN 50121-3-2.

Annex A
(informative)

Interference on telecommunication lines

A.1 Harmonics in the traction current

A.1.1 General

The harmonics in the traction current of a railway system may induce noise in a conventional analogue telecommunication system. The acceptable level of noise on conventional analogue telephone lines is specified by ITU-T. The value of this noise is measured with a psophometric filter. The relationship between the current absorbed or generated by the traction vehicle and the noise in the telephone line is neither under the total control of the vehicle manufacturer nor of the operator of the network. Thus, it is in the responsibility of the purchaser of the tractive stock in accordance with the rules of the Infrastructure manager to specify a frequency weighted current limit at the vehicle interface.

One method commonly used is to specify the psophometric current I_{pso} which has a psophometrical frequency weighting. The background and application of this method is described in this Annex. As it is known that the I_{pso} method does not fully represent the noise effect of the harmonics in the kHz range, alternative methods of frequency weighting may be specified by the purchaser.

A.1.2 Relationship between currents in railway system and noise on telecommunication lines

Conventional telecom copper cables in the vicinity of electrified railway lines are subject to electromagnetic disturbances caused by the currents in the railway system.

These disturbances result in induced longitudinal voltages ranging from the frequency of the fundamental wave to higher frequency harmonics. Sources of the harmonics are converters applied within the traction equipment of the traction stock and/or in the power supply station. Due to imbalances in the cable itself, these longitudinal voltages translate to transverse voltages or noise.

The relationship between the current absorbed by the traction vehicle and the noise on the telecom line is neither under the total control of the vehicle manufacturer nor of the railway and telecommunication network operators.

This relationship depends on:

1. the structure of the telecom cables
   - shielding, isolation to ground, balance of the cable;
2. the characteristics of the telecom terminals
   - susceptibility, input balance;
3. the topology of the telecom network
   - length of parallel sections of the telecom line to the tracks;
   - the distance between tracks and telecom lines;
   - the earth-resistivity;

4. the topology of the railway network

   — single/double track;

5. the type of power supply of the catenary

   — AC/DC;

   — substation ripple (DC rectifiers or AC 16,7 Hz static converters in some cases);

   — type of catenary and feeder system (e.g. 1 × 25 kV or 2 × 25 kV);

   — application of return conductors;

   — single-end or double-end supply of the section under consideration;

6. the density of train circulation;

7. the current absorption and generation of harmonics of the traction rolling stock;

8. the kind of harmonics superposition from a number of converters.

A.2 Psophometric current definition

The psophometric current is an equivalent disturbance current, which represents the effective disturbance of a current spectrum in a power circuit to a telephone line. It is defined by the formula:

$$I_{\mathrm{pso}} = \frac{1}{p_{800}} \sqrt{\sum (p_{\mathrm{f}}\ I_{\mathrm{f}})^2} \qquad \text{(A.1)}$$

where

I_{f} is the current component at frequency f in the contact line current.

p_{f} is the psophometric weighting.

The values of p_{f} may be found in the ITU-T Directive "Protection of telecommunications lines against harmful effects from electrical power and electrified railway lines, ITU-T O.41 and ITU-T K.68".

For measurement purposes, voltage and ampere meters which automatically calculate the signal according to these values of p_{f} by means of a psophometric filter are available.

A.3 Limits and test conditions

It is the responsibility of the purchaser to specify the maximum value of the psophometric current, and the conditions under which it is defined, including duration.

The following conditions are covered:

1. Limits of I_{pso} under normal and under reduced performance conditions (one or more traction converters temporarily out of service).

2. In the case of DC supply:

   — DC railways are normally fed by diode rectifiers from the 3-phase mains supply. Ideally, a single bridge rectifier produces a 6-pulse shape of voltage (i.e. first harmonic at 300 Hz in a 50 Hz mains) or two bridges produce a 12-pulse shape (i.e. 600 Hz). Due to imbalances in the rectifier and due to induction, a fundamental component at 50 Hz is commonly found.

— The presence of filters in the substation greatly reduces the effect of the substation.

— Nevertheless, in DC systems, the substation is the main source of perturbation.

— Thus, to qualify a traction vehicle, the contribution of the rectifier unit and filters of the fixed installation are relevant.

— It is also necessary to take into account the distance between the traction vehicle and the substation which affects the line inductance.

3. In the case of AC supply:

— If the line voltage distortion has to be taken into consideration, the essential harmonics have to be specified. If special resonance conditions in the catenary system are relevant, it is necessary to specify the relevant data. Otherwise the situation of the vehicle nearest to the supply station is assumed to give the highest value I_{pso}.

A.4 Measurement of the psophometric current

During acceptance tests or investigation tests, the disturbance current I_{pso} is measured on board the traction vehicle. Existing current sensors of the vehicle may be used, if their frequency response is sufficient (at least up to 5 kHz). The current is measured at the high voltage input of the vehicle and not on the ground side.

The psophometric current is measured by means of a psophometer or another adequate system which uses filtering according to the psophometric weighting factor p_f.

To obtain additional information about the composition of the spectrum and the sources of disturbance, the use of a dual channel spectrum analyser, applied to vehicle input current and input voltage, is strongly recommended.

The psophometric current is measured in normal and in reduced operation mode (not all converters operating). The interpretation of the measurement results takes into consideration the influence of operating conditions as well as changes in line inductance and supply voltage.

Effects due to transients (switching in the power circuits, pantograph bouncing, third rail/fourth rail gaps etc.) are out of the evaluation.

A.5 Calculation of the overall psophometric current of a trainset

A.5.1 Current of one tractive unit

A.5.1.1 General

Typically, the total current of a trainset is not available. Instead of installing a special measuring system which can generate an image of the total current from sensors distributed over the whole trainset, it is normally sufficient to pick up the current of one tractive unit of the trainset.

If the psophometric current is being measured at one power terminal of a trainset and this trainset has "n“ terminals, the total current is calculated according to the following rules.

A.5.1.2 DC systems

DC railways are normally fed by diode rectifiers from the three phase supply. If no special filters are applied, the ripple of the rectifier output contributes considerably to the psophometric current absorbed by vehicles in the supply section.

— **DC systems with dominating rectifier ripple**

(Vehicles with camshaft control; vehicles with chopper or inverter control, substation with 6-pulse rectifier without filtering)

$I_{pso\ (total)} = n \times I_{pso\ (one\ unit)}$

— **DC systems with converters on the vehicle and low rectifier ripple**

$I_{pso\ (total)}$ may be less than $I_{pso\ (one\ unit)}$, for choppers operating in interlaced mode

$I_{pso\ (total)} = \sqrt{n} \times I_{pso\ (one\ unit)}$, for choppers operating without synchronisation or for inverters directly connected to the power supply.

A.5.1.3 AC systems

The psophometric current generated by vehicles in the supply section depends mainly on the type of converter used on board the vehicle.

— **AC systems with phase controlled converters**

$I_{pso\ (total)} = \sqrt{n} \times I_{pso\ (one\ unit)}$. This seems to be based on a statistical mix of vehicle types, speeds and actual current consumption. But recent experience with high power trainsets shows that this $\sqrt{n}$-law is not applicable in the case of equal speeds, equal power and equal vehicle types, when $I_{pso\ (total)} = n \times I_{pso\ (one\ unit)}$ applies

— **AC systems with 4 quadrant converters (4QC, pulse width modulated line converter)**

$I_{pso\ (total)}$ may be less than $I_{pso\ (one\ unit)}$, if 4QC depends on the interlacing mode used (normal operating condition)

$I_{pso\ (total)} = n \times I_{pso\ (one\ unit)}$, if n equal units operate in non-interlaced mode.

Annex B
(normative)

Radiated electromagnetic disturbances - Measurement procedure

B.1 Purpose

This Annex describes a measurement method for evaluation and qualification of a complete railway vehicle or train concerning the noise generated in the range 150 kHz to 1 GHz. It fulfils most of the EN 50121-2:2016 measurement method recommendations but provides simplified features which significantly reduce the whole test duration.

B.2 Measuring equipment and test method

To reduce test duration, the frequency scanning technique is used. This can be done either by a spectrum analyser or a computer controlled receiver. Each frequency range is divided into several subranges.

Each evaluation of a train or a vehicle consists in doing a test of each subrange.

The apparatus shall scan this subrange continuously and memorize the maximum values reached during the test. This can be achieved by the "peak hold“ function or under computer control of the apparatus. This method assumes that the level and characteristics of electromagnetic noise do not vary significantly during each scan.

The position, location, type and other features concerning the antennas are the same as described in EN 50121-2:2016, Clause 5.

The measuring apparatus shall be in accordance with the requirements described in EN 55016-1-1:2010+A2:2014, Clause 5: “Peak measuring receivers for the frequency range 9 kHz to 18 GHz“.

Table B.1 may be used as a guideline for the test:

Table B.1 — Guideline for test

Band	Subrange Hz		Span [a] Hz	Bandwidth kHz		Sweep time [b] ms
B	150 k to	1,15 M	1 M	9 or	10	37
	1 M to	11 M	10 M	9 or	10	370
	10 M to	20 M	10 M	9 or	10	370
	20 M to	30 M	10 M	9 or	10	370
C/D	30 M to	230 M	200 M	100 or	120	42
	200 M to	500 M	300 M	100 or	120	63
	500 M to	1 G	500 M	100 or	120	100

[a] for a spectrum analyser

[b] may be slightly different from one instrument to another

Annex C
(informative)

Emission values for lower frequency range

In the early 1990s, measurements of emission from railway systems and railway vehicles were undertaken to get information about the values to be expected in the neighbourhood of railway systems. It was experienced that in particular the results of magnetic field measurements, at 10m distance, gave a poor reproducibility for frequencies below 150 kHz due to several reasons.

Due to the large variation in measured value (up to 20 dB) on the same vehicle depending on the location and other circumstances the reproducibility cannot be achieved and the usefulness is in question.

Since these emission values were published in the first editions of EN 50121-3-1 the graphs are shown in this informative annex without being a requirement to be fulfilled.

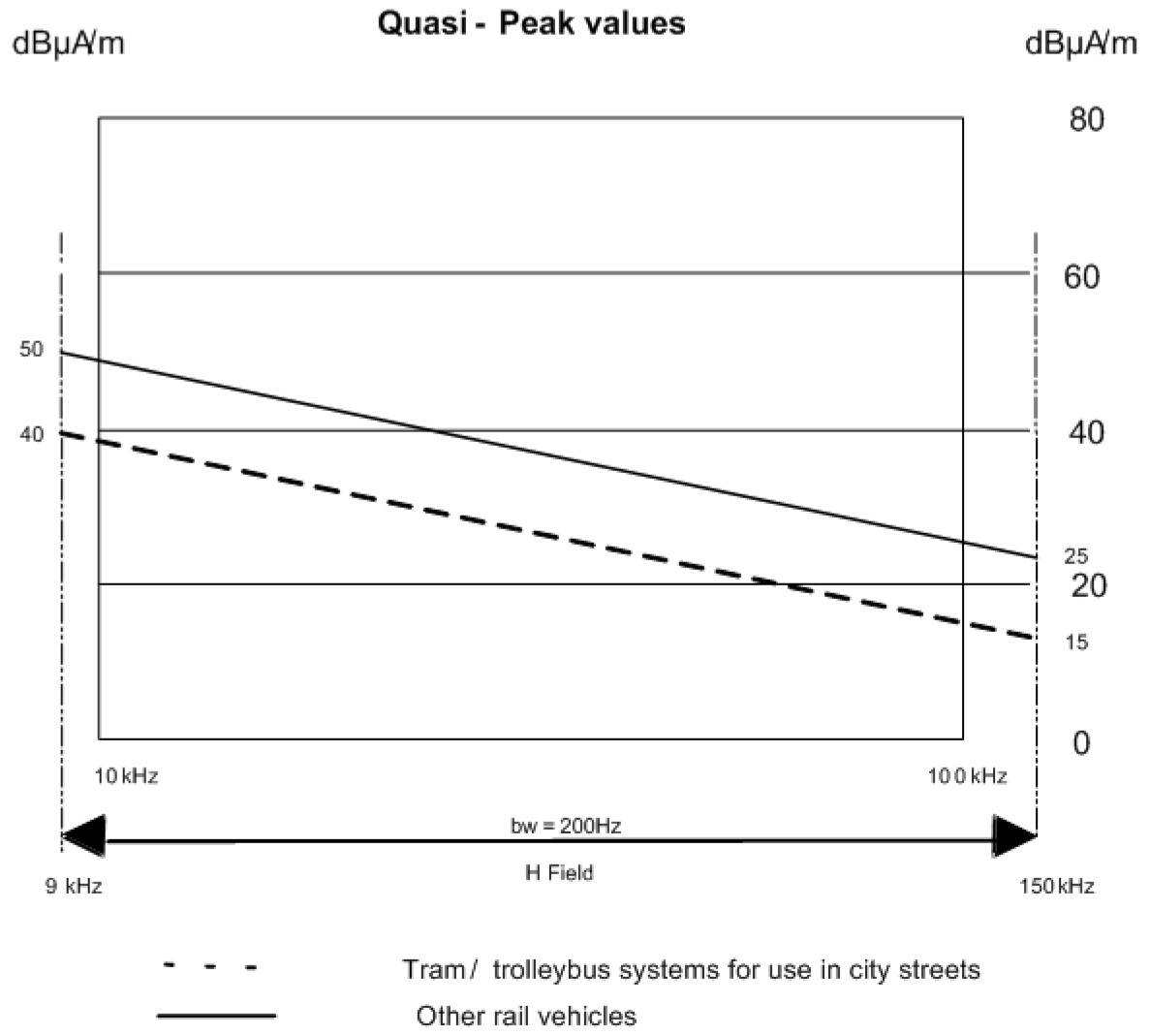

Figure C.1 — Emission values for stationary rolling stock

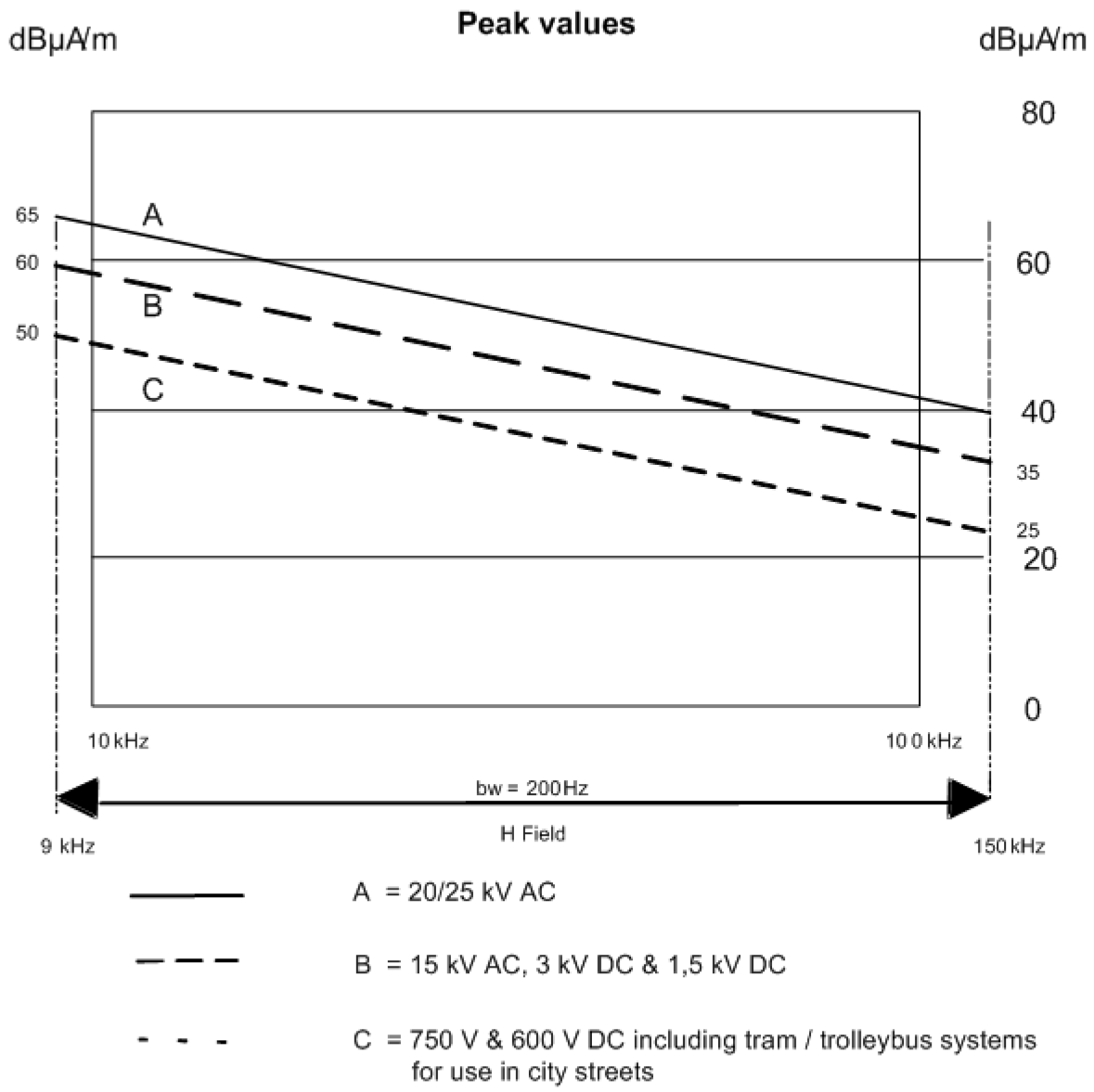

Figure C.2 — Emission values for slow moving rolling stock

Annex ZA
(informative)

Relationship between this European Standard and the essential requirements of Directive 2014/30/EU [2014 OJ L96] aimed to be covered

This European Standard has been prepared under a Commission's standardization request as regards harmonized standards in support of Directive 2014/30/EU relating to electromagnetic compatibility, to provide one voluntary means of conforming to essential requirements of Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility [2014 OJ L96].

Subclause 6.2 is not relevant in the scope of the Directive.

All types of rolling stock in the scope of this part of the standard are apparatus in the meaning of Article 19(1) 2nd paragraph of EU Directive 2014/30/EU intended for incorporation into a particular fixed installation.

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZZ.1 — Correspondence between this European standard and Annex I of Directive 2014/30/EU [2014 OJ L96]

Essential requirements of Directive 2014/30/EU	Clause(s) / subclause(s) of this EN	Remarks / Notes
Electromagnetic disturbances (emissions), Article 6 and Annex I(1)(a)	Clause 6, Emission tests and limits	
Electromagnetic immunity to electromagnetic disturbances (immunity), Article 6 and Annex I(1)(b)	Clause 5, Immunity requirements	

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Bibliography

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