



BSI Standards Publication

**Railway applications —
Procedure to determine the
performance requirements for
radio systems applied to
radio-based train control
systems**

National foreword

This Published Document is the UK implementation of IEC/TS 62773:2014.

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.

© The British Standards Institution 2014.
Published by BSI Standards Limited 2014

ISBN 978 0 580 77870 4
ICS 45.060.01

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

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 10 June 2014.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------



TECHNICAL SPECIFICATION



**Railway applications – Procedure to determine the performance requirements
for radio systems applied to radio-based train control systems**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

X

ICS 45.060

ISBN 978-2-8322-1519-7

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD..... 5

INTRODUCTION..... 7

1 Scope..... 8

2 Normative references 8

3 Terms, definitions and abbreviations 8

 3.1 Terms and definitions..... 8

 3.2 Abbreviations..... 9

4 Outline of the process for determining performance requirements 9

5 Definition of preconditions on available spectrum 11

 5.1 Environmental conditions 11

 5.1.1 General 11

 5.1.2 Obstacle 11

 5.1.3 Climate conditions 12

 5.1.4 Electromagnetic interference 12

 5.2 Regulatory constraints 12

6 Definition of preconditions on railway operation 12

 6.1 Railway line conditions 12

 6.1.1 General 12

 6.1.2 Line maximum speed 12

 6.1.3 Track conditions 13

 6.1.4 Line configurations 13

 6.1.5 Station configurations 13

 6.2 Operational conditions 13

 6.2.1 General 13

 6.2.2 Minimum design headway..... 13

 6.2.3 Maximum number of train in one control area..... 13

 6.3 TC communication requirement..... 14

 6.3.1 Maximum tolerable loss of communication 14

 6.3.2 Network latency 14

 6.3.3 TC transmission period 14

 6.3.4 TC throughput 14

 6.3.5 Control area 14

 6.3.6 Maintenance conditions 14

 6.4 Required type of transmission..... 14

7 Radio parameters 15

 7.1 General..... 15

 7.2 Security parameters..... 15

 7.3 Transmission parameters..... 15

8 Relationship between preconditions and radio parameters..... 15

 8.1 General..... 15

 8.2 Environmental conditions 17

 8.2.1 Obstacle and radio parameters 17

 8.2.2 Climate conditions and radio parameters 18

 8.2.3 Electromagnetic Interference and radio parameters 19

 8.3 Regulatory constraints and radio parameters 20

 8.4 Railway line conditions 21

8.4.1	Line maximum speed and radio parameters	21
8.4.2	Track conditions and radio parameters	22
8.4.3	Line configurations and radio parameters	23
8.4.4	Station configuration and radio parameters.....	24
8.5	Operational conditions	25
8.5.1	Minimum design headway and radio parameters.....	25
8.5.2	Maximum number of trains in one control area and radio parameters.....	26
8.6	TC communication requirement.....	27
8.6.1	Maximum tolerable loss of communication and radio parameters.....	27
8.6.2	Network latency and radio parameters	28
8.6.3	TC transmission period and radio parameters	29
8.6.4	TC throughput and radio parameters	30
8.6.5	Control area and radio parameters	31
8.6.6	Maintenance conditions and radio parameters	32
8.7	Required type of transmission and radio parameters.....	32
Annex A (informative) Additional preconditions		33
A.1	Operational conditions	33
A.1.1	Overlay on existing facilities	33
A.1.2	Signal aspect.....	33
A.1.3	Block	33
A.2	System conditions.....	33
A.2.1	General	33
A.2.2	Train localization	33
A.2.3	Continuous control/intermittent control	34
A.2.4	Train protection profile.....	34
A.2.5	System entry/exit.....	34
A.2.6	Temporary speed restriction	34
A.2.7	Emergency stop command.....	34
A.2.8	Interlocking control/locking control.....	34
A.2.9	Level crossing control.....	34
A.2.10	Couple and split a train.....	34
A.2.11	Automatic train operation.....	35
A.3	Relationship between preconditions and radio parameters.....	35
A.3.1	General	35
A.3.2	Operational conditions.....	36
A.3.3	System conditions	39
Annex B (informative) Considerations for in-continuity		46
B.1	Communication in in-continuity	46
B.2	Considerations for in-continuity in radio systems.....	46
B.2.1	General issues	46
B.2.2	Specific issues related to failure caused by external system factors	46
B.2.3	Specific issues related to failure caused by internal system factors	46
Bibliography.....		48
Figure 1 – Factors influencing performance requirements		10
Figure 2 – Maximum number of trains in case of divided area		13
Table 1 – List of preconditions and radio parameters		11

Table 2 – Relationship matrix between preconditions and radio parameters	16
Table 3 – Obstacle and radio parameters.....	17
Table 4 – Climate conditions and radio parameters.....	18
Table 5 – Electromagnetic interference and radio parameters	19
Table 6 – Regulatory constraints and radio parameters	20
Table 7 – Line maximum speed and radio parameters	21
Table 8 – Track conditions and radio parameters.....	22
Table 9 – Line configurations and radio parameters.....	23
Table 10 – Station configuration and radio parameters	24
Table 11 – Minimum design headway and radio parameters	25
Table 12 – Maximum number of trains in one control area and radio parameters	26
Table 13 – Maximum tolerable loss of communication and radio parameters.....	27
Table 14 – Network latency and radio parameters.....	28
Table 15 – TC transmission period and radio parameters.....	29
Table 16 – TC throughput and radio parameters	30
Table 17 – Control area and radio parameters	31
Table 18 – Maintenance conditions and radio parameters.....	32
Table 19 – Required type of transmission and radio parameters.....	32
Table A.1 – Relationship matrix between preconditions and radio parameters	35
Table A.2 – Overlay on existing facilities and radio parameters.....	36
Table A.3 – Signal aspect and radio parameters	37
Table A.4 – Block and radio parameters	38
Table A.5 – Train localization and radio parameters.....	39
Table A.6 – Train protection profile and radio parameters	40
Table A.7 – System entry/exit and radio parameters	41
Table A.8 – Temporary speed restriction and radio parameters.....	42
Table A.9 – Emergency stop command and radio parameters	43
Table A.10 – Interlocking control/route control and radio parameters	43
Table A.11 – Level crossing control and radio parameters	44
Table A.12 – Couple and split a train and radio parameters	45

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS – PROCEDURE TO DETERMINE
THE PERFORMANCE REQUIREMENTS FOR RADIO SYSTEMS
APPLIED TO RADIO-BASED TRAIN CONTROL SYSTEMS**

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62773, which is a technical specification, has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

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

Enquiry draft	Report on voting
9/1823/DTS	9/1899/RVC

Full information on the voting for the approval of this technical specification 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.

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

- transformed into an International standard,
- 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

The purpose of this Technical Specification is to provide a guideline for the rail transport authority and/or the supplier of the radio system to determine performance requirements of the radio system from the conditions of the railway systems using the radio-based train control systems.

This Technical Specification specifies the procedure to determine the performance requirements for radio system applied to the radio-based train control systems. The performance requirements are related to the radio parameters. Each radio parameter needs to be set to an appropriate value to enable data exchange with quality of service that will meet the requirements from the railway system as a whole and particularly the train control functions. Radio parameters are then decided based on the analysis of the conditions of the railway system using the train control system.

Currently in preview, click buy full version.

RAILWAY APPLICATIONS – PROCEDURE TO DETERMINE THE PERFORMANCE REQUIREMENTS FOR RADIO SYSTEMS APPLIED TO RADIO-BASED TRAIN CONTROL SYSTEMS

1 Scope

The objective of this Technical Specification is to establish a procedure to be used by rail transport authorities and/or radio suppliers to determine the appropriate performance requirements of radio system for a radio-based train control system, consistent with their specific business needs and existing conditions: the Technical Specification itself consists in defining a procedure linking preconditions to some radio parameters. Then, the appropriate performance requirements are deduced by the user of the Technical Specification from the radio parameters.

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.

None.

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

capacity

maximum amount of information transmitted and received per unit time on the radio link

3.1.2

data rate

amount of data transmitted over a given period of time (usually expressed in “bits per second” or “bytes per second”)

Note 1 to entry: The minimum data rate needs to take into account the maximum amount of transmitted data per unit time for the train control system.

3.1.3

cryptology

method of transmitting information so that third parties cannot decode it

Note 1 to entry: It serves to enhance the secrecy of information transmitted and received within the system.

3.1.4

handover

shift of connection to an adjacent radio base station