SLOVENSKI STANDARD
SIST ENV 12253:2003

01-oktober-2003

Cestna transportna in prometna telematika (RTTT) ï Posebna komunikacija kratkega dosega (DSRC) ï Fiziļ na plast na frekvenci 5,8 GHz

Road Transport and Traffic Telematics (RTTT) - Dedicated Short Range Communication (DSRC) - Physical Layer using Microwave at 5.8 GHz

Telematik für Straßenverkehr und Transport - Nahbereichskommunikation Bake-Fahrzeug - Physikalische Schicht auf Basis 5,8 GHz Träger

Ta slovenski standard je istoveten z: **ENV 12253:1997**

ICS:

35.100.10	Fiziļ ni sloj	Physical layer
35.240.60	Uporabniške rešitve IT v transportu in trgovini	IT applications in transport and trade

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EUROPEAN PRESTANDARD

PRÉNORME EUROPÉENNE

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ICS

Descriptors: teleprocessing, road transport, traffic, traffic control, data processing, information interchange, data transmission, open systems interconnection, physical layer

English version

Road Transport and Traffic Telematics (RTTT) - Dedicated Short Range Communication (DSRC) - Physical Layer using Microwave at 5.8 GHz

Telematik für Straßenverkehr und Transport - Nahbereichskommunikation Bake-Fahrzeug - Physkalische Schicht auf Basis 5,8 GHz Träger

This European Prestandard (ENV) was approved by CEN on 7 September 1997 as a prospective standard for provisional application.

The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard.

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword (Informative)

This European Prestandard has been prepared by Technical Committee CEN/TC 278 " Road transport and traffic telematics", the secretariat of which is held by NNI.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Prestandard was prepared by CEN TC278 WG9, using its subgroup SG.L1 and the project team CEN/TC278/PT06 to pursue its objective which is covered by CEN Work Item 00278092.

The subject Prestandard forms a part of a series of Prestandards defining the framework for a Dedicated Short Range Communication (DSRC) link in the RTTT environment. For basic information about RTTT application requirements and the resulting concept for DSRC, please refer to the TC 278 Internal Technical Report TC278/N198 "DSRC - 1st Status Report.

In addition to this Prestandard, the following parts will also be prepared by CEN/TC278 to build a complete set of Prestandards for the DSRC link:

prENV 00278093	"DSRC Physical Layer using Infrared at 850 nm"; CEN/TC278 Work Item 00278093; document TC278/N526
prENV 00278053	"DSRC Data Link Layer: MAC and LLC"; CEN/TC278 Work Item 00278053; document TC278/N474
prENV 00278051	"DSRC Application Layer"; CEN/TC278 Work Item 00278051, document TC278/N505
prENV 278/9/#74	"DSRC Communication Profiles"; CEN/TC278 Proposed Work Item 9.3

Further standardisation activities to extend the functionality of DSRC have been initiated on request of CEN/TC 278 with the intent to define additional co-existent low data rate channels.

WG9 consists of experts mainly from telecommunication sector and also from transport sector. Most active participating companies and organisations are:

Austria:	Alcatel, Efkon, Kapsch
France:	CGA, ISIS, Renault, Thomson
Germany:	Alcatel-SEL, Bosch-Telecom (ANT), Daimler-Benz Aerospace, RWTH, Siemens
Italy:	Alenia Marconi, Autostrade, UNINFO
Netherlands:	CMG
Norway:	Micro Design
Sweden:	SAAB Combitech Traffic, Telia Research
United Kingdom:	GEC Marconi, Peek plc, STCL

Recommendations and decisions taken by CEPT, ERC, and ETSI have served as references in the preparation of this Prestandard (see Section 2 - Normative References and Annex A - Bibliography).

Additional contributions came from non-European experts via ISO/TC 204/WG 15, especially from Japan and USA. Although, conditions and regulations for DSRC implementation are different in most regions of the world, e.g. frequency / wavelength band, maximum radiated power (EIRP), requested communication mode (half-duplex, full-duplex) and others. The presented DSRC standard is applicable at least in Europe.

Document Change Control Record (Informative)

Registration by CEN/TC 278	Ver-sion	Date	Change description
N293	-	1994-08-08	Output document of project team PT06, a very important contribution for standardisation of DSRC Physical Layer (5.8 GHz).
N387	3.0	1995-02-27	First presentation of draft prENV to CEN/TC278
N473	4.0	1995-09-25	Modification of version 3.0 in accordance with comments received on N387
(this version)	5.0	1996-12-10	(1) Modification of the 'Introduction' in accordance with resolution CEN/TC278/16.11 of1996-09-26 *(in italics)*; (2) Regular update of various reference numbers (CEN work item, ETSI, ...); (3) Deletion of bit rate options "below" the default bit rate (D8 / U8)

Contents (Informative)

Title Page (Informative) 1

Foreword (Informative) 3

Document Change Control Record (Informative) 4

Contents (Informative) 5

Introduction (Informative) 6

1 SCOPE (Normative) 6

2 NORMATIVE REFERENCES (Normative) 6

2.1 Normative Relationship with other Standards 6

3 DEFINITIONS, SYMBOLS AND ABBREVIATIONS (Normative) 7

3.1 Definitions for Downlink Parameters 7

3.2 Definitions for Uplink Parameters 9

3.3 Definition for Interface Parameters to DSRC Data Link Layer 11

3.4 Symbols 12

3.5 Abbreviations 12

4 REQUIREMENTS (Normative) 13

4.1 Downlink Parameters 13

4.2 Uplink Parameters 16

4.3 Interface Parameters to DSRC Data Link Layer 19

Annex A: Bibliography (informative) 20

Annex B: Installation and re-use distance of DSRC equipment (Informative) ... 21

Annex C: Link budget related parameters (Informative) 22

INTRODUCTION (Informative)

Dedicated Short Range Communication is intended to be a communication means for Road Transport and Traffic Telematics (RTTT) applications, amongst others such as Automatic Fee Collection (AFC), Automatic Vehicle and Equipment Identification (AVI/AEI) and Traffic and Traveller Information (TTI).

This European Prestandard comprises requirements for Open Systems Interconnection (OSI) Layer 1 at 5.8 GHz for DSRC. The Prestandard does not include associated measurement procedures for verification of the requirements. Measurement guidelines are intended to be developed in CEN/TC278/WG9, together with ETSI RES8, as a separate work item.

The presented requirements distinguish between default and optional parameter values. Procedures for using optional parameters include considerations also of upper OSI Layers. The elaboration of such procedures will be subject to further work within CEN/TC278/WG9.

This European Prestandard caters for on-board units based on transponder as well as transceiver technologies, and allows for interoperability between systems based on both of these technologies. Furthermore, the Prestandard allows for mixed time, frequency and space division multiple access approaches.

This European Prestandard is conceived for the 10 MHz part, i.e. 5.795 to 5.805 GHz, of the ISM band at 5.8 GHz which is recommended by CEPT. It is recommended to require the exclusive use of this part of the band, considering the probability of interference caused by, or with respect to, other non-DSRC systems. An additional sub-band (5.805 - 5.815 GHz) may be allocated on a national basis for RTTT. To avoid interference impacts, transponder systems based on the backscatter principle, should be equipped with intelligent media-access control.

Resolution 16.10 taken by CEN/TC 278 on 1996-09-26:

Subject: CEN/TC 278 - DSRC Standards for 5.8GHz

CEN/TC 278, in view of the high priority accorded by industry, road operators and the European Commission to establish DSRC standards (DSRC layer 1, layer 2 and layer 7) taking account of the problems encountered in gaining consensus caused by the presence in some countries of large populations of already deployed pre-existing systems, resolves that:

1) *it reaffirms the results of the work undertaken by WG 9 and reaffirms its commitment to the draft DSRC Standards (layer 1, layer 2, layer 7) for pan European use at 5.8 GHz.*

2) *it also recognises that already established and deployed systems in large scale should be tolerated as long as they are in the public domain and can co-exist with the DSRC Standards (for layer 1, layer 2 and layer 7) and wishes to enable and encourage their migration towards full interoperability.*

3) *it recognises that on-board equipment operating according to the DSRC Standards (layer 1, 2 and 7) does not interfere with tolling systems mentioned in .2) above working in the 5.8 GHz band.*

4) *it requires that the path by which interoperability and migration is to be achieved remains the responsibility of those not using the preferred specification.*

5) *it recognises that future applications may require expansion of the available bandwidth at 5.8GHz and will do its utmost in co-operation with ETSI to persuade CEPT to expand the available bandwidth.*

1 SCOPE (Normative)

This European Prestandard . . .

- establishes a common framework for Physical Layer at 5.8 GHz for DSRC for the RTTT sector.
- provides requirements for the communication medium to be used for exchange of information between road-side units (RSU) and on-board units (OBU).
- does not include associated measurement guidelines for verification of the formulated requirements in this Prestandard.
- does not consider any one specific RTTT application, but rather caters for a communication means to be used by several applications in the RTTT sector.

The Physical Layer, at 5.8 GHz, communication requirements for the information from the RSU to the OBU are accounted for as downlink parameters, while the requirements associated with the information from the OBU to the RSU are accounted for as uplink parameters.

Physical Layer 1 requirements related to the interface to other DSRC communication layers are accounted for in 'Interface to Other Layers'.

2 NORMATIVE REFERENCES (Normative)

This European Prestandard incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and publications are listed below. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

No.	Source	Title
1	ERC	"ERC Decision of 22 October 1992 on the frequency bands to be designated for the co-ordinated introduction of Road Transport Telematics Systems"; ERC / DEC (92)02.
2	ETSI	prI-ETS 300 674 ed. 1 Radio Equipment and Systems; Road Transport and Traffic Telematics; Technical characteristics and test methods for data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band

2.1 Normative Relationship with other Standards

Certain parameters in this European Prestandard and prI-ETS 300 674 are set by mutual agreement between ETSI and CEN. These parameters are identical in each standard and

cannot be changed by either ETSI or CEN without the simultaneous agreement of each of the two organisations.

3 DEFINITIONS, SYMBOLS AND ABBREVIATIONS (Normative)

3.1 Definitions for Downlink Parameters

Downlink parameters apply to transmission of data from RSU to OBU. For the purpose of this standard, the following definitions apply:

D 1 Carrier Frequencies

Number and values of the downlink carrier frequencies which are equal to the frequencies of the CW transmitted by the RSU and used by transponder OBUs for uplink communication. Each carrier frequency is the centre frequency of a downlink band.

D 1a Tolerance of Carrier Frequencies

Maximum deviation of the carrier frequency caused by any impact. It is expressed in parts per million (ppm).

Example: 1 ppm of a 5.8 GHz carrier allows for the carrier frequency to be in the range of 5.8 GHz ± 5.8 kHz.

D 2 RSU Transmitter Spectrum Mask

Maximum power (density) emitted by the RSU transmitter as function of the frequency .

D 3 OBU Minimum Receiver Bandwidth

Minimum range of frequencies which has to be received by the OBU receiver.

D 4 Maximum E.I.R.P.

The maximum peak envelope power transmitted by the RSU referred to an isotropic antenna. The value is normally expressed in dBm. 0 dBm equals 1 mW.

D 4a Angular E.I.R.P. mask

Maximum E.I.R.P. as a function of the angle Θ, where Θ indicates the angle relative to a vector perpendicular to the road surface, pointing downwards

D 5 Antenna Polarisation

Locus of the tip of the vector of the electrical field strength in a plane perpendicular to the transmission vector. Examples are horizontal and vertical linear polarisation and left and right hand circular polarisation.

D 5a Cross Polarisation

Ellipticity of an antenna.

Example: If an antenna is designed to be a left hand circular antenna and it may receive (transmit) as well right hand circular waves this is a mismatch. Cross Polar Discrimination (XPD) is measured as the ratio P_{LHC}/P_{RHC} of the power of the correct polarised wave P_{LHC} and of the wrong polarised wave P_{RHC}.

D 6 Modulation

Keying of the carrier wave by coded data. Some examples are Amplitude Shift Keying (ASK), Phase Shift Keying (PSK) and Frequency Shift Keying (FSK) and linear amplitude modulation (AM).

D 6a Modulation Index

Size of the variation of the modulation parameter (frequency, amplitude, phase) caused by the modulation signal (data signal).

D 6b Eye Pattern

Free decision distance in width and height of a digital signal. An ideal digital signal has a decision height of 100 % which is equal to the difference of high level and low level. Considering e.g. bi-phase coding, the ideal (=100%) distance in width is equal to half the bit duration.

D 7 Data Coding

Baseband signal presentation, i. e. a mapping of logical bits to physical signals. Examples are bi-phase schemes (Manchester, FM0, FM1, differential Manchester), NRZ and NRZI.

D 8 Bit Rate

Number of bits per second, independent of the data coding.

D 8a Tolerance of Bit Clock

Max. deviation of the bit clock caused by any impact, expressed in ppm or in %.

Example: 100 ppm of 500 kBit/s allows for the bit clock to be in the range of 500 kHz ± 50 Hz

D 9 Bit Error Rate (B.E.R.)

Averaged number of erroneous bits related to all transmitted bits. Used only as a reference value for layer 1. The realised B.E.R. depends on the application, and does not consider any specific distribution of errors. The effective B.E.R. within the communication zone may be different to the reference value due to time variant and stochastic impacts.

D 10 Wake-up Process for OBU

Process within the OBU which ...

(1) indicates to the OBU that it is within a communication zone, i.e. that it may now communicate with a RSU;

(2) switches the OBU main circuitry from stand by mode (sleep mode) to the active mode.

This is a feature to allow the OBU to save battery power. It is not mandatory for an OBU to use a wake-up process.

D 10a Maximum Start Time

Maximum time between the reception within the communication zone of a down-link message of minimum length, and the time when the OBU has switched to the active mode and is ready for operation.

D 11 Power Limits within Communication Zone

Minimum and maximum values of incident power referred to a 0 dB antenna in front of OBU and referred to the outside of the vehicle. These two values also specify the dynamic range of the OBU receiver. Power values are measured without any additional losses due to rain or misalignment.

D 13 Preamble

Specific Layer 1 address, independent of Layer 2. It is either only an unmodulated carrier wave or a modulated carrier, in which case the requirement refers to the channel after coding.

D 13a Preamble Length

Length of the preamble measured in number of bits.

D 13b Preamble Wave form

Signal shape of the preamble as it is on the channel.

3.2 Definitions for Uplink Parameters

Uplink parameters apply to transmission of data from OBU to RSU. For the purpose of this standard, the following definitions apply:

U 1 Sub-carrier Frequencies

Number and values of the uplink sub-carrier frequencies, i.e. the frequency distance of the centre of the uplink band to the corresponding downlink carrier, i.e. to the centre of the corresponding downlink band.

U 1a Tolerance of Sub-carrier Frequencies

Maximum deviation of the sub-carrier frequency caused by any impact. Normally it is expressed in % or in parts per million (ppm) of the sub-carrier frequency.

Example: 1 % of 1.5 MHz sub-carrier allows for the sub-carrier frequency to be in the range of 1.5 MHz ± 15 kHz.

U 1b Use of Side Bands

Specification of the use of the uplink sidebands. Data can be modulated on only the upper side band or on both side bands. As an option, different data can be modulated on the two side band.