SLOVENSKI STANDARD
SIST EN 12253:2004

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Nadomeġļa:
SIST ENV 12253:2003

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

Road transport and traffic telematics - Dedicated short-range communication - Physical layer using microwave at 5,8 GHz

Straßentransport- und Verkehrstelematik (RTTT) - Nahbereichskommunikation Fahrzeug -Bake (DSRC) -Bitübertragungsschicht für die Frequenz 5,8 GHz

Télématique des transports routiers - Communication a courte portée véhicule/infrastructure - Couche physique utilisant les micro-ondes a 5,8 GHz

Ta slovenski standard je istoveten z: **EN 12253:2004**

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 STANDARD

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EN 12253

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Supersedes ENV 12253:1997

English version

Road transport and traffic telematics - Dedicated short-range communication - Physical layer using microwave at 5,8 GHz

Télématique des transports routiers - Communication à courte portée véhicule/infrastructure - Couche physique utilisant les micro-ondes à 5,8 GHz

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This European Standard was approved by CEN on 23 April 2004.

CEN 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 Central Secretariat or to any CEN 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 CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents

Foreword

This document (EN 12253:2004) has been prepared by Technical Committee CEN/TC 278 “Road Transport and Traffic Telematics”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2005, and conflicting national standards shall be withdrawn at the latest by January 2005.

This document supersedes ENV 12253:1997

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This document replaces ENV 12253. In order to facilitate migration from European Pre-standard (ENV) to European Standard, equipment procured and installed in accordance with ENV 12253 has been considered when drafting this document.

This document forms part of a series of documents defining the framework of a Dedicated Short Range Communication (DSRC) link in the Road Transport and Traffic Telematics (RTTT) environment.

The communication requirements of many RTTT applications can be fulfilled by DSRC. The DSRC Standards enable compliant communication systems to serve multiple RTTT applications in parallel.

The small service areas and severe real-time constraints require a specific protocol architecture leading to the reduced protocol stack shown in Figure 1, consisting of the Application Layer, the Data Link Layer, and the Physical Layer. Such an architecture is very common for real-time environments.

This document deals with the physical layer of the DSRC protocol stack.

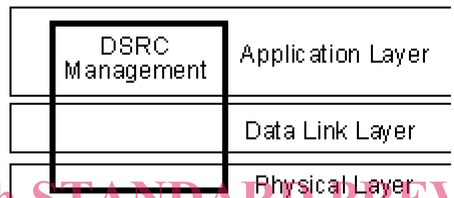

Figure 1 — DSRC protocol stack

The following set of documents for the DSRC link is issued by CEN:

EN 12253 *Road transport and traffic telematics - Dedicated short-range communication - Physical layer using microwave at 5,8 GHz*

EN 12795 *Road transport and traffic telematics - Dedicated Short Range Communication (DSRC) - DSRC data link layer: medium access and logical link control*

EN 12834 *Road transport and traffic telematics - Dedicated Short Range Communication (DSRC) - DSRC application layer*

EN 13372 *Road transport and traffic telematics - Dedicated short-range communication - Profiles for RTTT applications*

This document comprises requirements for Open Systems Interconnection (OSI) Layer 1 at 5,8 GHz for DSRC. It does not include associated measurement procedures for verification of the requirements. Test methods for conformity are provided in ETSI EN 300674-1, ETSI EN 300674-2-1, ETSI EN 300674-2-2.

This European Standard caters for on-board units based on transponder technologies. Furthermore, it allows for mixed time, frequency and space division multiple access approaches.

This European Standard is conceived for the 10 MHz part, i.e. 5,795 GHz to 5,805 GHz, of the ISM band at 5,8 GHz which is recommended by ECC/DEC(01)01. An additional sub-band (5,805 GHz - 5,815 GHz) may be allocated on a national basis for RTTT. National restrictions on the usage of these frequency bands may apply according to CEPT/ERC REC 70-03.

1 Scope

The DSRC Standards EN 12253, EN 12795 and EN 12834, which together form a three-layered architecture for DSRC, are designed to encompass a wide range of services for different purposes in order to make the basic DSRC architecture suited for many different applications and for a wide range of possible products and systems.

This document:

— specifies a physical layer at 5,8 GHz for DSRC as applicable in the field of Road Transport and Traffic Telematics (RTTT).

— provides requirements for the communication medium to be used for exchange of information between road-side units (RSU) and on-board units (OBU).

— caters for a communication means to be used by several applications in the RTTT sector.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ETSI EN 300674-1 Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 1: General characteristics and test methods for Road Side Units (RSU) and On-Board Units (OBU)

3 Terms and definitions

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

3.1 General definitions

3.1.1
Adjacent channel
refers to the use of a neighbouring DSRC channel by two or more emissions

Note: It is possible that a DSRC channel has either one or two adjacent channels.

3.1.2
Antenna bore sight direction
direction of maximum antenna gain

3.1.3
Bit error ratio
averaged number of erroneous bits relative to the total number of transmitted bits

3.1.4
Channel
for DSRC, a channel is indicated by reference to the downlink centre frequency of one of up to four frequency bands with 5 MHz width each.

3.1.5
Co-channel
refers to the use of the same DSRC channel by two or more emissions

3.1.6
Downlink communication
Communication from the RSU to the OBU

3.1.7
On Board Unit (OBU)
physical assembly that is located and operated in or on the vehicle to transmit and/or receive DSRC signals. It may be in a form that is removable from the vehicle, or mountable in or on any part of the vehicle structure, or bonded to a part of the vehicle, or an integral part of a vehicle component, such as a windscreen, bumper or licence plate. In this document, parameters that refer to an OBU relate to the form that the OBU takes as it is supplied to the vehicle manufacturer or constructor.

3.1.8
Roadside Unit (RSU)
DSRC equipment usually residing by the side of the road or overhead the road

3.1.9
Uplink communication
communication from the OBU to the RSU

3.2 Downlink parameters

Downlink parameters (prefixed D) apply to transmission of data from RSU to OBU.

3.2.1
D1 — 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 channel.

3.2.2
D1a — Tolerance of carrier frequencies
maximum deviation of the carrier frequency resulting from any cause. 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.

3.2.3
D2 — RSU transmitter spectrum mask
maximum allowed power within a defined frequency band emitted by the RSU transmitter

3.2.4
D3 — OBU minimum frequency range
minimum range of frequencies that has to be received by the OBU receiver.

3.2.5
D4 — Maximum E.I.R.P.
See ETSI EN 300674-1

3.2.6
D4a — Angular E.I.R.P. mask
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

3.2.7
D5 — 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.

3.2.8
D5a — Cross-polarisation (ellipticity of polarisation)
antenna designed to transmit left hand circular waves may transmit some right hand circular waves in addition. Cross-Polar Discrimination (XPD) is defined as the ratio between left and right hand circular power P_{LHC}/P_{RHC}, when the total power transmitted is $P_{LHC} + P_{RHC}$.

3.2.9
D6 — Modulation
keying of the carrier wave by coded data. Some examples are Amplitude Shift Keying (ASK), Phase Shift Keying (PSK), Frequency Shift Keying (FSK) and linear Amplitude Modulation (AM).

3.2.10
D6a — Modulation index
ratio of the variation of the modulation parameter (frequency, amplitude, phase) caused by the modulation signal (data signal)

For amplitude modulation the modulation index is

$$m = \frac{V_{\max} - V_{\min}}{V_{\max} + V_{\min}}$$

where V is the envelope amplitude of the modulated signal.

3.2.11
D7 — Data coding
base band 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. NRZI: No transition at beginning of "1" bit, transition at beginning of "0" bit, no transition within bit.

3.2.12
D8 — Bit rate
number of bits per second, independent of the data coding

3.2.13
D8a — Tolerance of bit clock
maximum deviation of the bit clock resulting from any cause, expressed in ppm

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

3.2.14
D9 — Bit error ratio for communication
maximum allowed bit error ratio valid within the dynamic range of the receiver as defined by D11a and D11b

3.2.15
D10 — Wake-up trigger for OBU
signal which

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

b) switches the OBU main circuitry from 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.