SLOVENSKI STANDARD
SIST EN 300 674 V1.1.1:2003

01-december-2003

Elektromagnetna združljivost in zadeve v zvezi z radijskim spektrom (ERM) ï Cestna transportna in prometna telematika (RTTT) ï Tehniļne karakteristike in preskusne metode za oddajniġko opremo za enouporabniġko (osebno) komunikacijo kratkega dosega (DSRC) (s prenosnima hitrostma 500 kbit/s/250 kbit/s), ki deluje v pasu 5,8 GHz, namenjenem industrijski, znanstveni in medicinski uporabi

ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Technical characteristics and test methods for 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

Ta slovenski standard je istoveten z: **EN 300 674 Version 1.1.1**

ICS:

33.060.99	Druga oprema za radijske komunikacije	Other equipment for radiocommunications
33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general
35.240.60	Uporabniške rešitve IT v transportu in trgovini	IT applications in transport and trade

SIST EN 300 674 V1.1.1:2003 **en**

EN 300 674 V1.1.1 (1999-02)

European Standard (Telecommunications series)

Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Technical characteristics and test methods for 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

Reference
DEN/ERM-RP08-0105 (68o00ico.PDF)

Keywords
data, radio, RTTT, testing

ETSI

Postal address
F-06921 Sophia Antipolis Cedex - FRANCE

Office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16
Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Internet
secretariat@etsi.fr
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Contents

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document together with ETS 300 683, is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility ("the EMC Directive") (89/336/EEC as amended).

Technical specifications relevant to the EMC Directive are given in annex G.

As a result of a meeting between CEN, CEPT, ETSI, and the European Commission on 29 June 1998, the existing work item was split as follows:

- EN 300 674, supporting the CEN TC 278 RTTT system;
- ES 200 674-1, supporting RTTT systems with lower data rates;
- ES 200 674-2, supporting RTTT systems with higher data rates.

National transposition dates	
Date of adoption of this EN:	22 January 1999
Date of latest announcement of this EN (doa):	30 April 1999
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 October 1999
Date of withdrawal of any conflicting National Standard (dow):	30 April 2002

Introduction

The present document was drafted on the assumption that type test measurements, performed in an accredited test laboratory, will be accepted by the various national regulatory authorities in order to grant type approval, provided the national regulatory requirements are met. This is in compliance with CEPT/ERC Recommendation 70-03 [3].

The present document specifies the requirements for a dedicated 5,8 GHz short range microwave link intended for a European wide data communication system for Road Transport and Traffic Telematics (RTTT) applications.

RTTT systems for Europe-wide use are specified by CEN. The necessary set of radio parameters for the support of ENV 12253 [1] is included in the present document.

The parameters might be subject to changes if necessary and when other RTTT systems specified by CEN require this.

The RSU transmitter operates on a non-exclusive basis on frequencies depending on the declared application according to ERC/DEC(92)02 [2].

A channel spacing of 5 MHz is used for channels 1, 2, 3 and 4, see table 1.

Table 1: RTTT transmitter frequencies for 5 MHz channel spacing systems

	Initial road to Vehicle systems	Multi lane road junctions (options)
Channel 1	5,800 GHz - 2,5 MHz	
Channel 2	5,800 GHz + 2,5 MHz	
Channel 3		5,810 GHz - 2,5 MHz
Channel 4		5,810 GHz + 2,5 MHz

In order to permit the greatest freedom of design of equipment, whilst protecting other radio services from interference, a balance is required between the permitted range of frequencies on which the equipment may be used, and its frequency stability and modulation characteristics. The present document specifies the operational frequencies and system bandwidths. However, the present document does not fully describe the permitted range of optional frequencies as these are covered by national regulations. The optional range of frequencies offered should be specified on each type approval certificate issued.

Clauses 1 and 3 give a general description of the types of equipment covered by the present document and the definitions and abbreviations used. Clause 4 gives general requirement in order that type tests may be carried out and any markings on the equipment to be provided by the manufacturer.

Clauses 5 and 6 specify the test conditions.

Clauses 7 and 8 specify the limits of the parameters which are required to be tested for the RSU transmitters and receivers 1. These limits have been chosen to minimize harmful interference to and from other equipment and services. These clauses also specify how the equipment is to be tested and the conditions which are applied.

Clause 9 specifies the limits of the parameters which are required to be tested for transponders. These limits are chosen to restrict the access to and radiation from transponders. Details on the test methods for the transponders are also specified.

Clause 10 specifies the maximum measurement uncertainty values.

Annex A provides normative specifications concerning test sites for radiated measurements.

Annex B provides normative descriptions of measurement methods for radiated measurements.

Annex C provides normative descriptions of alternative measurement methods for receivers.

Annex D contains technical specification relevant to the EMC Directives.

1 Scope

The present document specifies radio parameters which are necessary for the efficient use of the radio spectrum and for the purpose of type approval. This includes methods of measurements for verifying the limits stated in the present document.

The present document applies to 5,8 GHz Short Range Devices (SRDs) for use in Road Transport Traffic and Telematics (RTTT):

- with a Radio Frequency (RF) output connection and specified antenna or with an integral antenna;
- for data transmission only;
- operating on radio frequencies in the 5 725 MHz to 5 875 MHz Industrial, Scientific and Medical (ISM) band.

The applicability of the present document covers both the Road Side Units (RSUs) and the On Board Units (OBUs) with transceivers and transponders.

The present document does not necessarily include all the characteristics which may be required by a user, nor does it necessarily represent the optimum performance achievable.

The present document complies with ERC/DEC/(92)02 [2] and CEPT/ERC Recommendation 70-03 [3]. It is a specific standard covering various RTTT applications.

For non-harmonized parameters, national regulatory conditions may apply regarding the type of modulation, channel / frequency separation, maximum transmitter output power / effective radiated power, equipment marking as a condition of the issue of an individual or general license, or, as a condition of use under license exemption.

Additional standards or specifications may be required for equipment such as that intended for connection to the Public Switched Telephone Network (PSTN) or other systems.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] ENV 12253 (1997): "Road Transport and Traffic Telematics (RTTT); Dedicated Short-range Communication (DSRC); Physical Layer using Microwave at 5,8 GHz".

[2] ERC/DEC/(92)02: "ERC Decision of 22 October 1992 on the frequency bands to be designated for the co-ordinated introduction of Road Transport Telematic systems(RTT)".

[3] CEPT/ERC Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)".

[4] CISPR 16-1: "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1: Radio disturbance and immunity measuring apparatus".

[5] ETR 028: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[6] ITU-T Recommendation O.153 (1992): "Basic parameters for the measurement of error performance at bit rates below the primary rate".

[7] IEC 721-3-4 (1995): "Classification of environmental conditions; Part 3: Classification of groups of environmental parameters and their severities; Section 4: Stationary use at non-weatherprotected locations".

[8] IEC 721-3-5 (1997): "Classification of environmental conditions; Part 3: Classification of groups of environmental parameters and their severities; Section 5: Ground vehicle installations".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

assigned frequency band: the frequency band within which the device is authorized to operate.

Road Side Unit (RSU): equipment intended for use in a fixed location (Fixed Station).

integral antenna: an antenna, with or without a connector, designed as an indispensable part of the equipment.

integrated antenna: an antenna, without connector, integrated as part of the equipment.

successful message ratio: the proportion of transmitted messages that are received correctly under test conditions.

On Board Unit (OBU): a device normally fixed in a vehicle which responds to an interrogating signal.

portable station: equipment intended to be carried, attached or implanted.

operating frequency: the nominal frequency at which equipment is operated; also referred to as the operating centre frequency. Equipment may be able to operate at more than one operating frequency.

operating frequency range: the range of operating frequencies over which the equipment can be adjusted through switching or reprogramming.

radiated measurements: measurements which involve the absolute measurement of a radiated field.

transceiver OBU: On Board Unit (OBU) with local Rx and Tx 5,8 GHz frequency generation.

transponder: On Board Unit (OBU) without own 5,8 GHz frequency generation.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

dBi	Gain relative to an isotropic antenna
E	Field strength
E_o	Reference field strength, (see subclause A.3.2.)
f_S	Transmitter carrier frequency
f_{TX}	Declared transponder subcarrier frequency
λ	Wavelength
ppm	parts per million (10^{-6})
R	Distance, (see subclause A.3.2.)
R_o	Reference distance, (see subclause A.3.2.)
Rx	Receiver
Tx	Transmitter

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

eirp	equivalent isotropically radiated power
EUT	Equipment Under Test
IF	Intermediate Frequency
ISM	Industrial, Scientific and Medical

NOTE: The present document covers only the following designated ISM band: 5 725 MHz to 5 875 MHz.

OEM	Original Equipment Manufacturer
OBU	On Board Unit
PSK	Phase Shift Keying
PSTN	Public Switched Telephone Network
RF	Radio Frequency
RSU	Road Side Unit
RTTT	Road Transport and Traffic Telematics
SRD	Short Range Device
VSWR	Voltage Standing Wave Ratio

4 General

4.1 Presentation of equipment for testing purposes

Each equipment submitted for type testing shall fulfil the requirements of the present document on all frequencies over which it is intended to operate.

The applicant shall complete the appropriate application form when submitting equipment for type testing. Additionally, technical documentation and operating manuals shall be supplied.

The performance of the equipment submitted for testing shall be representative of the performance of the corresponding production model. In order to avoid any ambiguity in that assessment, the present document contains instructions for the presentation of equipment for type testing purposes (this subclause), conditions of testing (see clause 5) and measurement methods (see clauses 7, 8 and 9).

Stand alone equipment shall be offered by the applicant complete with any ancillary equipment needed for testing. The applicant shall declare the frequency range(s), the range of operation conditions and power requirements, as applicable, in order to establish the appropriate test conditions.

Test fixtures may be supplied by the applicant (see subclause 6.7).

Original Equipment Manufacturers' (OEM) plug-in cards or units may be offered for testing together with a suitable test fixture. Alternatively, complete RTTT equipment may be supplied by the manufacturer to facilitate the tests.

To simplify and harmonize the testing procedures between the different test laboratories, measurements shall be performed, according to the present document, on samples of equipment defined in subclauses 4.1.1 and 4.1.2.

These subclauses are intended to give confidence that the requirements set out in the present document have been met without the necessity of performing measurements on all optional frequencies.

4.1.1 Choice of model for testing

The applicant shall provide one or more production models of the equipment, as appropriate, for testing.

Equipment designed for use with an integral antenna may be supplied with a temporary external / internal or permanent internal 50 Ω connector for the purpose of testing, providing the characteristics being measured are not expected to be affected. The measurements, wherever possible, should be made by use of a direct connection to the equipment under test (antenna connector or temporary 50 Ω connector) as stated in the present document, in order to ensure that the measurement uncertainties are minimized. If applicable, the means to access and/or implement the internal connector should be provided by the applicant with the aid of a diagram (see subclause 4.1.4). If a temporary 50 Ω RF connector is used, this shall be stated on the test report form.

4.1.2 Choice of operating frequencies

Where equipment can be adjusted to operate at different operating frequencies other than channels 1 and 2 (see table 1), a minimum of two operating frequencies shall be chosen such that the lower and higher limits of the applicant's declared operating ranges of the equipment are covered.

4.1.3 Testing of equipment with or without a permanent external RF port

To facilitate relative measurements, use may be made of a test fixture as described in subclause 6.7, or the equipment may be supplied with a permanent internal / external or temporary internal / external RF port.

4.1.4 Equipment with a permanent internal RF port

The way to access a permanent internal RF port shall be stated by the applicant with the aid of a diagram. The fact that use has been made of a permanent internal RF port shall be recorded in the test report.

4.1.5 Equipment with a temporary RF port

The applicant shall submit two sets of equipment to the test laboratory, one fitted with a temporary 50 Ω RF connector with the antenna disconnected and the other with the antenna connected. Each equipment shall be used for the appropriate tests.

The way the temporary RF port is implemented shall be stated by the applicant with the aid of a diagram. The fact that use has been made of the temporary RF port to facilitate measurements shall be stated in the test report. The addition of a temporary RF port should not influence the performance of the Equipment Under Test (EUT).

4.1.6 Antennas

If the equipment to be tested can be equipped with one or more antennas, the manufacturer shall declare and provide these together with the equipment. These antennas shall be used during the radiated measurements described in the present document. The manufacturer shall declare the gain of the antenna or antenna assembly(ies). The characteristics of the antenna assembly(ies) shall be included in the user documentation supplied with the equipment.

4.2 Mechanical and electrical design

4.2.1 General

The equipment submitted by the applicant or his representative, shall be designed, constructed and manufactured in accordance with good engineering practice, with the aim of minimizing harmful interference to other equipment and services.

Transmitters and receivers may be individual or combination units.

4.2.2 Controls

Those controls which if maladjusted might increase the interference possibilities to and from the equipment shall only be accessible by partial or complete disassembly of the device and requiring the use of tools.

4.2.3 Marking

The equipment shall be marked in a visible place. This marking shall be legible and durable.

4.2.3A Equipment identification

The marking shall include as a minimum:

- the name of the applicant or his trade mark;
- the type designation.

4.2.4 Receiver data squelch

If the receiver is equipped with a data squelch or battery saving circuit, it shall be possible to override this circuit for the duration of some tests.

4.3 Declarations by the applicant

When submitting equipment for testing, the applicant shall supply the necessary information according to the appropriate application form for the present document.

4.4 Auxiliary test equipment

All necessary test signal sources and setting up information shall accompany the equipment when it is submitted for type testing.

4.5 Interpretation of the measurement results

The interpretation of the results recorded on the appropriate test report form for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit shall be used to decide whether an equipment meets the requirements of the present document;
- the measurement uncertainty value for the measurement of each parameter shall be included in the test report;
- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures of measurement uncertainty given in clause 10.

5 Test conditions, power sources and ambient temperatures

5.1 Normal and extreme test conditions

Testing shall be made under normal test conditions and also, where stated, under extreme test conditions.

The test conditions and procedures shall be as specified in subclauses 5.2 to 5.4.