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Elektronsko pobiranje pristojbin - Motnje na napravah CEN DSRC zaradi naprav radijskega lokalnega omrežja, ki delujejo v frekvenčnem območju 5 GHz - Rezultati testne kampanje

Electronic fee collection - Interferences on CEN DSRC devices from radio local area network devices operating in the 5 GHz frequency range - Results of a test campaign

Elektronische Gebührenerhebung - Funkstörung von CEN-DSRC-Geräten durch drahtlose Nahbereichsnetzwerk-Geräte, die im Frequenzbereich von 5 GHz betrieben werden - Ergebnisse einer Testkampagne

Perception de télépéage - Interférences provenant de réseaux locaux sans fil fonctionnant dans la gamme de fréquences de 5 GHz, sur des dispositifs CEN DSRC - Résultats d'une campagne de tests

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TECHNICAL REPORT
RAPPORT TECHNIQUE
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FINAL DRAFT
FprCEN/TR 18358

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ICS

English Version

Electronic fee collection - Interferences on CEN DSRC devices from radio local area network devices operating in the 5 GHz frequency range - Results of a test campaign

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This draft Technical Report is submitted to CEN members for Vote. It has been drawn up by the Technical Committee CEN/TC 278.

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (FprCEN/TR 18358:2026) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

This document is currently submitted to the Vote on TR.

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Introduction

This document contains results of the test campaign on CEN dedicated short-range communication (DSRC) technology that was conducted at the European Commission's Joint Research Centre (JRC) in Ispra (Italy) during two weeks in August 2024.

CEN DSRC technology has been developed specifically to provide a reliable and effective communication means for traffic and transport applications in single lane and high speed multilane free flow environments. The aim of the test was to evaluate the effects of the radio interference caused by radio local area network (RLAN) devices operating in frequency bands close to or within the 5,8 GHz CEN DSRC frequency band, whilst noting that the CEN DSRC technology is adopted in the following European Union regulations:

- European electronic toll service (EETS) (i.e. Directive (EU) 2019/520 ^[1] and Regulation (EU) 2020/204 ^[2])
- Tachographs in road transport (i.e. Regulation (EU) No 165/2014, Regulation (EU) 2020/1054 ^[3], Regulation (EU) 2021/1228 ^[4], Implementing Regulation 2016/799 and its Appendix 14 "Remote communication function (DSRC)" ^[16])
- Maximum authorised weights and dimensions for road motor vehicles (i.e. Directive (EU) 2015/719 ^[17])

Tests were performed based on the specifications in CEN/TS 18078.

Six victim devices, i.e. roadside equipment (RSE) and on-board equipment (OBE), used in the test campaign have been provided, configured and operated by 5 manufacturers. The provided devices are compliant to European standards for CEN DSRC electronic fee collection (EFC), aka as electronic road tolling, i.e. EN 12253, EN 15509, ETSI EN 300 674-2-1 and ETSI EN 300 674-2-2. Results for high data rate DSRC devices compliant to ETSI ES 200 674-1 are not included in this report.

Interrogators for a remote readout of the tachograph OBE and the weights and dimensions OBE use the same DSRC technology^[6]. These OBE devices are mounted like an EFC OBE in trucks. The RSE mounting geometry for this application is similar to the RSE test setup used in the test campaign as shown in Figure 7. Therefore, the findings in this document relating to CEN DSRC EFC devices, especially those for trucks when interrogated by a fixed compliance checking RSE, also apply to EU-regulated tachograph devices.

1 Scope

This document contains test results on RLAN interference to CEN DSRC devices, including the setup and execution of the tests, along with the main findings.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN ISO 17573-2, *Electronic fee collection - System architecture for vehicle related tolling - Part 2: Vocabulary (ISO 17573-2)*

3 Terms and definitions

For the purposes of this document, the terms and definitions in EN ISO 17573-2 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

adjacent band

frequency band directly above or below to the CEN DSRC band with no gap in-between

3.2

blocking

performance reduction of a victim receiver caused by a radio signal at a frequency outside the operational bandwidth of the victim receiver

3.3

DSRC line-of-sight

ideal line connecting the two DSRC devices, i.e. the RSE and OBE that together form the victim system [3.10]

3.4

harmful interference

radio interference that obstructs or interrupts the communication or the functioning of a victim system

3.5

in band

frequency that is overlapped by the CEN DSRC band

3.6

interference

performance reduction of a victim system caused by a radio signal at a frequency within the operational bandwidth of the victim system

3.7

out of band

frequencies outside the CEN DSRC band

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3.8 test transaction

DSRC interaction made of a cycle of two related frames, the first one sent by the RSE and the second one sent by the OBE

Note 1 to entry: The test transaction is part of a DSRC transaction that consists of an initialisation, a transaction and a closing phase, according to ISO 14906. The transaction phase consists of EFC ECHO functions.

3.9 victim device

radio device that suffers harmful interference from another system (the interfering system)

Note 1 to entry: In this document, the victim device is the DSRC device that suffers from interference or blocking caused by RLAN.

3.10 victim system

DSRC communication system consisting of RSE and OBE, suffering from interference by RLAN transmissions

4 Symbols and abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

BER	bit error ratio
CBW	channel band width
CEPT	European Conference of Postal and Telecommunications Administrations (In French: Conférence européenne des administrations des postes et télécommunications)
CH	channel
dB	decibel
dBi	decibel relative to isotropic radiation (unit of antenna gain)
DUT	device under test
DSRC	dedicated short-range communication
FER	Frame error ratio
FSPL	free space path loss
EFC	electronic fee collection
ES	ETSI Standard
ETSI	European Telecommunication Standards Institute
JRC	Joint Research Centre
OBE	on-board equipment
OOB	out of band
PSD	power spectral density
QAM	quadrature amplitude modulation
RFID	radio frequency identification

RLAN	radio local area network
RSE	roadside equipment
RX	receive
SRD	short range device
S/I	signal to interference ratio

For the purposes of this document, the following symbols apply.

@	at
b	limit value of <i>bend</i> parameter in the FER fit function (3)
<i>bend</i>	parameter to adjust the knee region of the FER fit function (3)
CarOBE1	First OBE intended to be used in passenger cars as DUT
CarOBE2	Second OBE intended to be used in passenger cars as DUT
CH #	channel number
f	frequency
F-F0	frequency relative to RLAN centre frequency
f_{DSRC}	CEN DSRC frequency
f_{RLAN}	RLAN frequency
γ_{RLAN}	azimuth angle of the RLAN transmitter (interferer)
OBU Rx	CEN DSRC receive signal power level at the OBE
$P_{50\%}$	RLAN power level at the DUT for a FER of 50%
P_{RLAN}	RLAN power level at the DUT
Θ_{OBE}	elevation angle of the OBE
Θ_{RLAN}	elevation angle of the RLAN transmitter (interferer)
Θ_{RSE}	elevation angle of the RSE
RSE1	RSE used as DUT
$S/I_{50\%}$	signal to interference ratio for a FER of 50%
<i>slope</i>	slope parameter of the FER fit function (3)
\vec{S}_{OBE}	direction of OBE antenna main lobe
\vec{S}_{RSE}	direction of RSE antenna main lobe
TruckOBE1	First OBE intended to be used in trucks as DUT
TruckOBE2	Second OBE intended to be used in trucks as DUT
TruckOBE3	Third OBE intended to be used in trucks as DUT
x	RLAN power level offset as input to the FER fit function (3)