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Elektronsko pobiranje pristojbin - Zahteve za mestne posebne komunikacije kratkega dosega

Electronic fee collection - Requirements for urban dedicated short-range communication

Elektronische Gebührenerfassung - Urbane Anforderungen für die Kurzstreckenkommunikation

Perception de Télépéage - Exigences pour l'usage du DSRC en urbain

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Electronic fee collection - Requirements for urban dedicated short-range communication

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Elektronische Gebührenerfassung - Urbane Anforderungen für die Kurzstreckenkommunikation

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Foreword

This document (CEN/TR 16040:2010) has been prepared by Technical Committee CEN/TC 278 “Road transport and traffic telematics”, the secretariat of which is held by NEN.

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Introduction

Electronic Fee Collection (EFC) systems that use DSRC are normally implemented on inter-urban highways (motorways and expressways). Referring to the use of common DSRC installations and specifications for urban areas, therefore, pre-supposes that the way in which they are implemented will be similar, or can be made to be similar to the inter-urban highway environment.

However, urban areas can be very different and can be highly constraining. These constraints may affect the specification and implementation of DSRC EFC systems in these areas, such that there is a perceived need to be able to define DSRC requirements that are specific to the “urban” context.

Urban Road User Charging Schemes are likely to become much more common across Europe as a means of seeking to restrain traffic demand in order to reduce congestion and pollution in city centres. Hence, there is a need to ensure that charging point and equipment designs are specifically taking into account the urban context. The objective of this Technical Report is to analyse the particular requirements that the urban environment place on EFC systems.

This technical report includes a set of requirements for functionality, design and environmental issues. The mandatory EFC functions include some specific quality parameters linked to some of the functions. For the optional functions and for the design and environmental issues some typical and/or feasible quality parameters are given in Notes. It is foreseen that each Urban Charging Scheme defines its own set of quality parameters enabling a compliance checking of the urban charging system against the scheme requirements, e.g. the probability for a wrong classification. It should be noted that this Technical Report reflects the performance levels required by the EFC operators enabling them to handle high traffic volumes in urban areas in environments different from those defined or observed in EFC systems on motorways. The requirements are also technology independent and different technologies and different tolling schemes may have an impact on the final requirements defined for each urban tolling system.

It should also be noted that this technical report also includes some requirements that are not only related to urban charging but also to charging outside urban areas, e.g. on high speed and high volume charging points on motorways. This has been done to include issues and/or requirements that are important not only to urban charging but to EFC in general.

This technical report reflects the requirements of the EFC Service Providers and Toll Chargers for urban tolling systems.

1 Scope

This technical report analyses DSRC Urban Charge Point Requirements including the following issues:

— The core requirements and functionality that must be provided within DSRC equipment in an urban context;

— The potential aesthetic impact;

— How to handle the different traffic conditions in urban areas;

— Accommodation of the diversity of road users;

— The potential need to address highly variable topology;

— A wide variety of installation challenges;

— Minimisation of the impact of E-M interference;

— How to ensure interoperability with systems in non-urban contexts (e.g. motorways, plaza systems, handheld readers, etc);

— How to minimise and, if possible, have no impact upon OBE design;

— Relations to other existing standards in this domain;

— How to meet international requirements for Health and Safety;

— The wider policy context that city centres must address in addition to tackling congestion.

The physical location and configuration of the installation represent a compromise between the needs of the DSRC transaction, of the local electromagnetic environment and of the existing built environment locally both above and below ground. The urban charging system, of which the DSRC element is a part, will be required to fit within a wider social and transport policy context.

It is recognised that not all the elements above lend themselves to a standard, nor will industry be interested in promoting all above topics. However, with an increasing number of urban Charging Schemes being considered, there is a need to create relevant standards from the above lists and hence make it easier for suppliers to offer equipment and services to meet the requirements.

2 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.

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*

prEN ISO 12855, *Electronic fee collection — Information exchange between service provision and toll charging (ISO/DIS 12855:2009)*

EN 13372, *Road Transport and Traffic Telematics (RTTT) — Dedicated short-range communication — Profiles for RTTT applications*

EN 15509, *Electronic fee collection — Interoperable Application Profile for DSR*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 60721-3-4, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Section 4: Stationary use at non-weatherprotected locations (IEC 60721-3-4:1995)*

EN 300 674-2-1, *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 2: Harmonized EN under article 3.2 of the R&TTE Directive; Sub-part 1: Requirements for the Road Side Units (RSU)*

EN ISO 14906, *Electronic fee collection — Application interface definition for DSRC communication*

CEN ISO/TS 25110, *Electronic fee collection — Interface definition for on-board account using integrated circuit card (ICC)*

3 Terms and definitions

3.1
Charge Area
anywhere within the width of the carriageway (all lanes in both directions) at the charge point + 1.0 meter outside the carriageway on both sides of the carriageway limited in the travelling direction by the footprint of the DSRC beacons

NOTE The term is also in other references used for describing the whole geographical area covered by the EFC system.

3.2
Charging Scheme
description of an Electronic Fee Collection system and its context including (but not limited to) the motivation and strategy for the fee collection, the definition of the geographical area, road network or road section where the fee will be collected, vehicles types subject to fee collection, fee payment rules, tariffs, exception handling and enforcement rules, technology to be used, implementation and duration and how the collected fee will be used

3.3
Charging System
system for Electronic Fee Collection supporting and fulfilling the requirements of a Charging Scheme

3.4
Roadside Equipment
equipment beside or above the carriageway for the purpose of communication and data exchange with On-Board Equipment (OBE) and for the collection of other vehicle data, e.g. vehicle location, driving direction, vehicle physical attributes, vehicle number plate

NOTE The definition is extended and slightly changed compared to the EN ISO 17573 definition of Roadside Equipment. The Roadside Equipment may also in some cases include equipment in the carriageway surface, e.g. inductive loops.

3.5
Urban Charge Point
physical and geographically limited area equipped with, as a minimum, Roadside Equipment, gantries, poles and outriggers, powers supply, cabinets and cabling and Central Equipment communication where the installed equipment performs the necessary data exchange with OBEs passing in the charging direction(s)

NOTE The Urban Charge Point will also in a more enhanced mode collect information about non-equipped vehicles and vehicle characteristics, e.g. information used for classification.

4 Abbreviations

For the purpose of this document, the following abbreviations apply throughout the document unless otherwise specified.

ANPR	Automatic Number Plate Recognition
CE	Central Equipment
DSRC	Dedicated Short Range Communication
EETS	European Electronic Toll Service
EFC	Electronic Fee Collection
LP	Licence Plate
LPN	Licence Plate Number
OBE	On-Board Equipment
UCP	Urban Charging Point
UCPC	Urban Charge Point Controller
UPS	Uninterruptible Power Supply

5 Urban charging context

5.1 Urban constraints

5.1.1 Streetscape and aesthetic impact

The physical appearance of the roadside installations is a much more sensitive issue in urban areas than in inter-urban contexts. There are generally tighter restrictions as well as existing visual, environmental and historical contexts. Street furniture needs to be sympathetic to such contexts, including colour, style, size and location.

Only rarely will it be possible to even contemplate the use of gantries and thick structural elements in these locations. This reflects the fact that many more people live and work in urban areas and they have some degree of ownership of that landscape.

As a policy, road user charging is sensitive enough without the controversy associated with physical changes to the local built environment. Therefore, any system that is deployed in the urban environment must be discreet, have minimal impact and be sympathetic to the surrounding environment.

5.1.2 Chaotic traffic behaviour

The traffic characteristics in urban areas are different from inter-urban contexts, including much more chaotic patterns of movement and behaviour. The urban road can be just as much a destination as it is a through-route, for a wide range of people and goods. With road works, building works, parked or static objects, contra-flow bus lanes, slow traffic, overtaking and general chaotic driving behaviour in urban areas, there is often no real concept of a left or right hand “side” of the road, no real concept of a lane, and the potential for unusual manoeuvres (e.g. u-turns and reversing) at any location on the road at almost any time.

Unlike inter-urban roads, urban thoroughfares have a very diverse range of traffic restrictions and traffic management measures on them, including segregated lanes, traffic islands, chicanes, barriers, rising bollards, road humps, textured surfaces, pedestrian crossings and roundabouts. There may also be greater congestion, leading to slow-moving, closely-spaced traffic. Finally charges may be applied which are direction dependant. Therefore, any system that is deployed should provide complete carriageway coverage for the monitored directions and have the capability to determine the direction of travel.

5.1.3 Diversity of road users

The range of objects on or adjacent to roads in urban areas is different from inter-urban contexts, reflecting the greater diversity of travel activities taking place in urban areas. This includes a much wider range of powered and un-powered vehicles, pedestrians, static objects (e.g. refuse skips, parked vehicles, trees) and animals. It is also reasonable to expect that for any particular urban Charging Scheme there will be a mixture of DSRC tag equipped and non-equipped vehicles legally using the road, with potentially a relatively high proportion of non-equipped users. Again this reflects the fact that, as a destination, the urban area cannot always be by-passed, unlike most inter-urban routes and it is unlikely that all objects using the road will be subject to a charge.

5.1.4 Highly variable road topology

The topology of a road in an urban area is much more likely to vary between different charge point locations than in an inter-urban context. Road widths are highly variable ranging from as little as 3 m through to 5 or 6 lanes in each direction at busy intersections. Footways, narrowing roads, bends, skew junctions and roundabouts all reflect the extent to which urban roads are as much multi-purpose spaces between the buildings (and the subject of historical precedent and shared usage) as they are a thoroughfare designed to move traffic.

5.1.5 Challenging installation

With lower traffic speeds, urban roads are much more likely than inter-urban roads to have other physical structures immediately adjacent to, over and below the road / road surface. This will include railway lines, tram lines, power lines, telephone lines, buildings, sewers, ducts, water, gas and electricity supplies.

The works involved in constructing charge points may require a degree of consultation with the owners of such assets in terms of disruption and future access. This creates straightforward physical as well as logistical and administrative challenges in trying to erect structures, tune performance and maintain systems. Ultimately this may limit the range of locations where charge points can be erected. It may also limit the range of engineering fixes that can be deployed at particular locations. The complexity of services beneath urban streets underlines the need for flexible positioning of communication zones and the desire to minimise the size of the cabinet and the associated equipment.

5.1.6 Electromagnetic interference

Urban roads are much more likely to contain structures (e.g. building facades, cabinets, rubbish bins, lamp posts, trees, traffic lights, bollards), large vehicles (e.g. double deck buses, lorries, delivery vans, trams) and radio sources (e.g. consumer electrical equipment, business equipment, wireless communication equipment) that are capable of making the electromagnetic environment for DSRC considerably more complex than it is in inter-urban contexts. There is also the opposite interference problem to overcome — the potential for charge point equipment to interfere with equipment in homes, shops, offices, etc. Such equipment may be very old or

defective. Any interference may not only be a nuisance or an inconvenience, solving it may present real engineering challenges and it may also fuel (possibly unnecessary) concerns about health and safety impacts of such equipment.

5.1.7 Health and safety

Most people live and work in urban areas. The urban context changes the nature and extent of the potential exposure. On a regular basis, people will be walking under and potentially working, living and sleeping within range of the radio emissions from such equipment. The DSRC installations must take full account of the existing regulations, standards and recommendations to ensure the health and safety of urban road users as well as those performing maintenance activities. However, calculations show that the DSRC equipment used today having strict limits for power transmitted should not result in any health and safety risks for human beings.

5.1.8 Wider policy context

Unlike many inter-urban routes, management of urban road networks takes place within a broader social and transport policy context. Increasingly such policies are seeking to achieve a higher degree of integration of transport modes and to promote the use of public transport. New technologies and payment means are being developed and implemented to this end, such as contact and contact-less chip cards and there is a desire to support 'interoperability' from the user's, operator's and central government's perspectives.

5.2 Urban charging

The definition of urban charging can be taken to be any location where some or all of the following constraints apply:

— There is an existing aesthetic (e.g. architectural, historical) context;

— Many people not only travel past, but also live and work near to the installation; seeing and experiencing it close up on a daily basis;

— The physical proximity of people passing by and using shops, homes and offices nearby presents a different type and extent of exposure in terms of the health and safety characteristics of the installation;

— The road in the vicinity of the installation may be a destination for people and goods as well as a through-route;

— There may be no obvious left or right hand side of the road, no concept of lanes, and unusual manoeuvres will not be infrequent or illegal events;

— Frequently there may be slow-moving, closely-spaced traffic;

— The widest possible range of vehicles may use the road legally;

— The road in the vicinity of the installation may be occupied temporarily or permanently by a variety of static objects, such as trees and parked vehicles;

— Not all objects passing through the charge point will be eligible for the charge;

— The topology of the road may be highly variable from one installation to the next reflecting the spaces between buildings as much as the needs of the thoroughfare;

— The physical location and configuration of the installation represents a compromise between the needs of the DSRC transaction, of the local electromagnetic environment and of the existing local built environment both above and below ground; and

— The urban charging system, of which the DSRC element is a part, will be required to fit within a wider social and transport policy context.

6 Urban Charge Point (UCP) elements

6.1 Mandatory Physical Elements

6.1.1 General

The figure below depicts the typical elements of a DSRC-based Urban Charging Point:

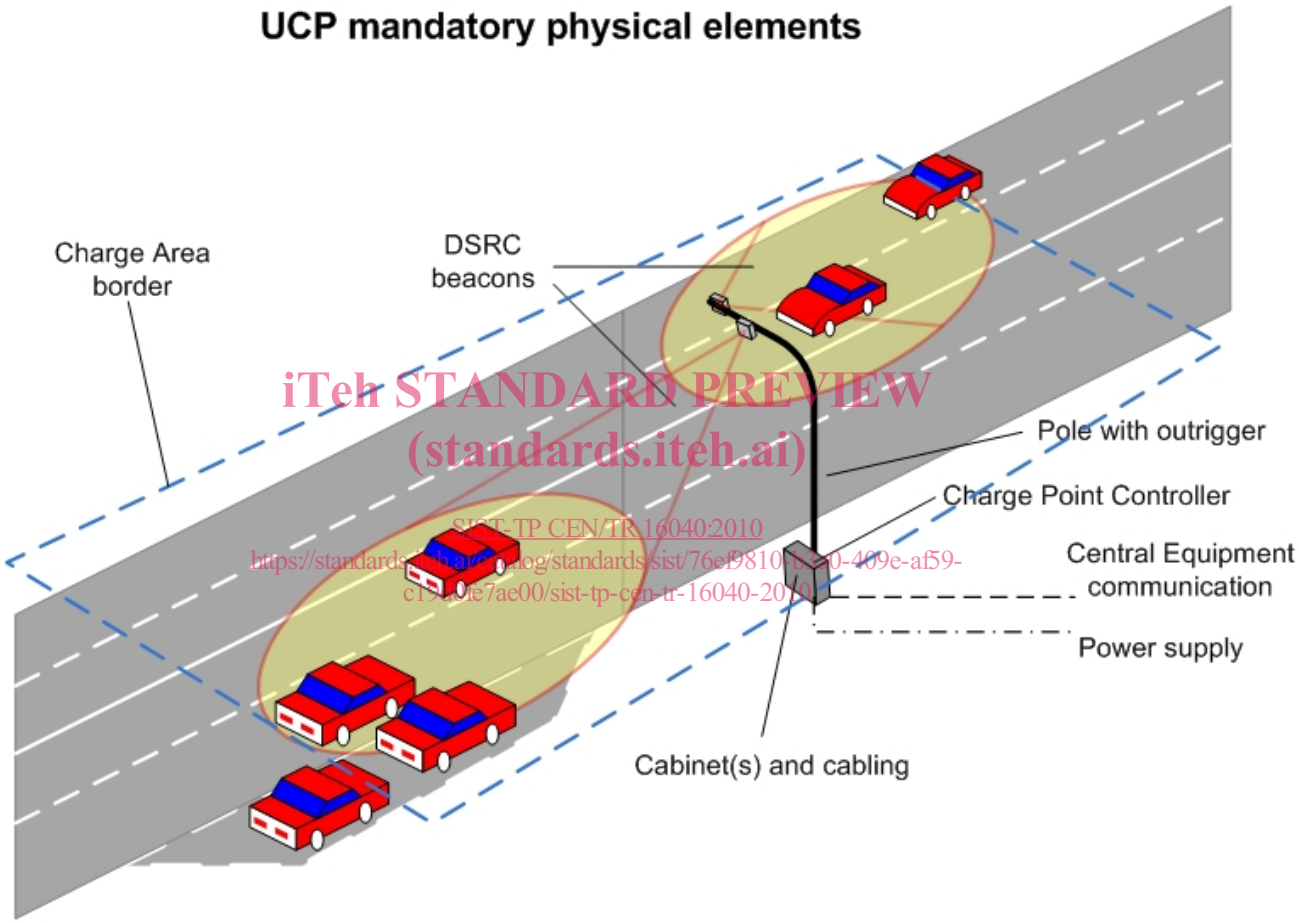

Figure 1 — Typical elements of a DSRC-based Urban Charge Point

6.1.2 Roadside Equipment

6.1.2.1 DSRC beacon(s)

On top of the pole, on the outrigger or on the vertical beam of the gantry the DSRC beacon or an array of DSRC beacons shall be mounted, facing towards the road surface providing a communication zone covering the width of the Charge Area. The beacons shall be either interconnected among themselves or connected directly via cable to the roadside cabinet accommodating both the power supply and the charge point controller.