ISO/TR 21190:2018-12 (E)

Electronic fee collection - Investigation of charging policies and technologies for future standardization

Contents

Page

Foreword v

Introduction vi

1 Scope 1

2 Normative references 1

3 Termsanddefinitions 1

4 Abbreviated terms 2

5 Charging policies 4
5.1 General description 4
5.2 Conventional charging policies 4
5.2.1 Financial sources for road construction 4
5.2.2 Financial sources for road maintenance 4
5.2.3 Reduction for congestion in urban area 4
5.2.4 Internalizing external costs 5
5.2.5 Summary of conventional charging policies 5
5.3 New charging policies 5
5.3.1 Financial source for road construction with low cost devices 5
5.3.2 Financial source for road maintenance alternative to fuel tax 5
5.3.3 Provision of appropriate route or lane 6
5.3.4 Integration of C-ITS technology with EFC 6
5.3.5 Fair charging rates 6
5.3.6 Summary of new charging policies 6
5.4 Integrated charging policies 7
5.4.1 General 7
5.4.2 Financial source for road construction and maintenance 7
5.4.3 Traffic management by charging 7
5.4.4 Internalizing external costs 7
5.4.5 Fair charging rates 7
5.4.6 Summary of integrated charging policies 7

6 Functional requirements 8
6.1 EFC function 8
6.1.1 EFC functional model 8
6.1.2 Charging 9
6.1.3 Enforcement 11
6.1.4 Information provision 11
6.1.5 Payment 12
6.2 Relation between charging policies and EFC functions 12
6.3 EFC functional requirements 13
6.3.1 Charging 13
6.3.2 Enforcement 14
6.3.3 Information provision 14
6.3.4 Summary of EFC functional requirements 14

7 Technology for requirements 15
7.1 General 15

7.2 Charging 15
7.2.1 Distance driven 15
7.2.2 Vehicle class 16
7.2.3 Time class 16
7.2.4 Location class 16
7.2.5 Traffic conditions 16
7.2.6 Summary 16
7.3 Enforcement 17
7.3.1 Payment avoidance 17

7.3.2 Over loaded 18
7.3.3 Summary 18
7.4 Information provision 18
7.4.1 Tariff information 18
7.4.2 Level of services (LOS) 19
7.4.3 Charge amount 19
7.4.4 Summary 19

8 Charging technologies 20
8.1 General description 20
8.1.1 Eliminated EFC technologies or equipment 20
8.2 Existing technologies 21
8.2.1 DSRC 21
8.2.2 Autonomous systems (GNSS/CN) 21
8.2.3 ANPR 22
8.3 Emerging technologies 23
8.3.1 Probe data 23
8.3.2 Odometer 24
8.3.3 Passive RFID 24
8.3.4 WAVE 25
8.3.5 WIM 27
8.3.6 Other technologies 28
8.4 Consideration of mutual applicability 29
8.4.1 General 29
8.4.2 Existing technologies for new charging policies 29
8.4.3 Emerging technologies for conventional charging policies 29
8.4.4 Emerging technologies for new charging policies 29

9 Recommendations 30
9.1 General 30
9.1.1 Evaluation criteria 31
9.2 Evaluations 32
9.2.1 Charging assist traffic management 32
9.2.2 Passive UHF RFID-based EFC 32
9.2.3 Odometer-based EFC 32
9.2.4 ANPR based EFC 32
9.2.5 Toll-by-weight 33
9.2.6 WAVE based EFC 33
9.2.7 CN-5G for EFC 33
9.2.8 A-GNSS for EFC 33
9.3 Summary 33

Annex A (informative) Application of technology to EFC systems 35

Annex B (informative) Example of tariffs 43

Annex C (informative) Comparison of communication technologies 51

Annex D (informative) Examples of legislation for charging policy 61

Bibliography 63