

ICS 35.100.10
CCS L 79



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 20851.5-2007

**[including 2012XG] Electronic toll collection -- Dedicated short
range communication -- Part 5: Test methods of the main
parameters in physical layer
(English Translation)**

Issued on: March 19, 2007

Implemented on: May 1, 2007

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine of the People's Republic of China**

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Foreword

GB/T 20851-2007 Electronic toll collection - Dedicated short range communication is divided into.

- Part 1.Physical payer;
- Part 2.Data link layer;
- Part 3.Application layer;
- Part 4.Equipment application;
- Part 5.Test methods of the main parameters in physical layer.

This is part 5 of GB/T 20851-2007.

This Part was proposed by Ministry of Transport.

This Part shall be under the jurisdiction of National Technical Committee (SAC/TC 268) on Intelligent Transportation System (ITS) of Standardization Administration of China.

Drafting organization of this Part. Highway Research Institute of Ministry of Transport.

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Electronic Toll Collection - Dedicated Short Range
Communication - Part 5.Test Methods of the
Main Parameters in Physical Layer

1 Scope

This Part specifies the main test equipment of main parameters in physical layer of electronic toll collection (ETC) - dedicated short range communication (DSRC), and recommended characteristics, test conditions and test methods of accessories.

This Part is applicable to the test of main parameters of the physical layer of electronic toll collection - dedicated short range communication roadside unit (RSU) and on-board unit (OBU).

This Part is applicable to highways and city roads' electronic toll collection system. Fields such as automatic vehicle identification, vehicle access management may reference to this Part for the use.

2 Normative references

The articles contained in the following documents have become articles of this Part of GB/T 20851 when they are quoted herein. For the dated documents so quoted, all the modifications (excluding corrections) or revisions made thereafter shall not be applicable to this Part. For the undated documents so quoted, the latest editions shall be applicable to this Part.

GB 9254-1998 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (idt CISPR 22:1997)

GB/T 12190-2006 Method for measuring the shielding effectiveness of electromagnetic shielding enclosures

GB/T 20851.1-2007 Electronic toll collection - Dedicated short range communication - Part 1. Physical layer

3.1 Symbols

Following symbols apply to this Part.

dBc refers to the ratio of power to carrier signal power

dBm refers to the ratio of power to 1mW, 0 dBm = 1mW

e.i.r.p.con refers to spurious equivalent isotropic radiated power

e.i.r.p_{max} refers to maximum equivalent isotropic radiated power

f_c refers to center frequency of signal source transmitted signal

f_{Tx} refers to nominal carrier frequency

f_{Txa} refers to actual carrier frequency

G_T refers to test antenna gain

G_{Rx} refers to receiving antenna gain of device under test

G_{Tx} refers to transmitting antenna gain of device under test

m refers to modulation index

P_{con} refers to spurious emission power

P_{cw} refers to single-frequency signal power of device under test

P_{cwo} refers to signal source and single-frequency signal power of test antenna

P_o refers to signal source output power

Δf refers to carrier frequency error

3.2 Abbreviations

Following abbreviations apply to this Part

DSRC Dedicated Short Range Communication

ETC Electronic Toll Collection

OBU On Board Unit

RBW Resolution Band Width

RSU Roadside Unit

VSWR Voltage Standing-Wave Ratio

4 Main test equipment and recommended characteristics of

accessories

4.1 Power meter

- Power measurement range. -60 dBm ~ +20 dBm;
- Frequency range. 10 MHz~18 GHz;
- Power measurement error. ±3%.

4.2 Frequency meter

- Frequency range. 10 Hz~+20 GHz;
- Frequency measurement error. $\pm 10 \times 10^{-9}$.

4.3 Microwave signal source

- Frequency range. 250 kHz~20 GHz;
- Frequency accuracy. $f_c \times 10 \times 10^{-9}$;
- Phase noise. Less than -98 dBc/Hz@10 GHz, 1 kHz bias.

4.4 Spectrum analyzer

- Frequency range. 3 Hz~26.5 GHz;
- Dynamic range. Not less than 70 dB;
- Resolution bandwidth. 10 Hz~3 MHz;
- Background noise. Not greater than -140 dBm/Hz.

4.5 Vector signal analyzer

- Frequency range. DC~6 GHz;
- Vector modulation analysis type. Amplitude modulation, frequency modulation and phase modulation analysis.

4.6 Digital oscilloscope

- Bandwidth. 1 GHz;
- Sampling rate. 2 Gsa/s;
- Memory depth. 2 M points for each channel;

6.4.1.1 Test equipment

Power meter.

6.4.1.2 Test steps

Test steps are as follows.

- a) Set the operating frequency of transmitter of device under test; set device under test in a non-modulation state, i.e. carrier state;