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

GB/T 20851.1-2019

Replacing GB/T 20851.1-2007

**Electronic toll collection - Dedicated short range
communication - Part 1: Physical layer**

电子收费 专用短程通信 第1部分：物理层

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Foreword

GB/T 20851 Electronic Toll Collection - Dedicated Short Range Communication can be divided into the following 5 parts:

--- Part 1: Physical Layer;

--- 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 Part belongs to Part 1 of GB/T 20851. This Part was drafted as per the rules specified in GB/T 1.1-2009. This Part replaced GB/T 20851.1-2007 Electronic Toll Collection - Dedicated Short Range Communication - Part 1: Physical Layer. Compared with GB/T 20851.1-2007, this Part has the major technical changes as follows besides the editorial modification:

--- Modify the downlink technical requirements; transfer the contents of "downlink" into "downlink technical requirements" (see Clause 6 of this Edition;

5.2 of 2007 Edition);

--- Add the provisions on the indicators such as downlink antenna sidelobe level, antenna front-to-rear ratio, 14kHz square wave wake-up signal accuracy, OBU maximum input signal power, OBU co-channel interference rejection ratio, OBU adjacent channel interference rejection ratio, OBU blocking interference rejection ratio, etc. (see Clause 6 of this Edition);

--- Modify the provisions of the indicators such as downlink modulation factor, OBU receiving bandwidth, preamble, etc. (see Clause 6 of this Edition;

5.2 of 2007 Edition);

--- Modify the uplink technical requirements; transfer the contents of "uplink" into "uplink technical requirements" (see Clause 7 of this Edition;

5.3 of 2007 Edition);

--- Add the provisions of indicators such as uplink RSU maximum input signal power, RSU co-channel interference rejection ratio, RSU adjacent channel interference rejection ratio, RSU blocking interference rejection ratio, RSU receiving bandwidth, etc. (see Clause 7 of this Edition);

1 Scope

China's national physical layer specification for the dedicated short range communication used in electronic toll collection. It is Part 1 of GB/T 20851 and specifies the basic requirements for the DSRC physical layer together with the downlink and uplink technical requirements, and it applies to electronic toll collection on highways and urban roads, with reference use in automatic vehicle identification and vehicle access management. This is the layer on which the entire national ETC system rests, and its constraints are unusual. The link is between a roadside unit on a gantry and an on-board unit on a windscreen, and it has to complete a full authenticated transaction while the vehicle passes through a communication zone a few metres long at highway speed - a window of the order of a hundred milliseconds. The on-board unit is battery powered and must last years, which rules out a conventional transmitter; the Chinese system, like the European one it derives from, uses a passive backscatter uplink in which the OBE modulates and reflects the carrier the roadside unit provides rather than generating its own. So the physical layer must define two asymmetric links: a downlink from an active transmitter, and an uplink that is a reflection. What this part fixes is therefore the carrier frequencies and channel arrangement in the 5.8 GHz band, the modulation and coding in each direction, the data rates, the transmit power and the spectrum mask, the receiver sensitivity, the antenna polarisation, and the shape and boundaries of the communication zone - because a zone that is too large captures the vehicle in the adjacent lane. Issued on 10 May 2019 and in force since 1 December 2019, it replaces GB/T 20851.1-2007.

This Part of GB/T 20851 specifies the basic requirements for the physical layer of dedicated short-range communication of electronic toll collection, as well as the downlink and uplink technical requirements. This Part is applicable to the electronic toll collection system on the highway and city road; while the automatic vehicle identification, vehicle access management, and the like fields can use for reference.

2 Normative References

The following documents are essential to the application of this document. For the dated

documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this document.

GB/T 9410-2008 General Specification for Antennas Used in the Mobile Communications

GB/T 13622-2012 Terminology for Radio Regulation

GB/T 14733.7-2008 Terminology for Telecommunication - Oscillations, Signals and Related Devices

GB/T 14733.9-2008 Terminology for Telecommunication - Radio Wave Propagation

GB/T 20839-2007 Intelligent Transport Systems - General Terminology

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in GB/T 9410-2008, GB/T 13622-2012, GB/T 14733.7-2008, GB/T 14733.9-2008 and GB/T 20839-2007 and the following apply.

3.1 Wakeup The process in which the on-board unit (OBU) transmitting from a sleep state to an active state.

3.2 Preamble The advance signal of the physical layer frame information, irrelevant to the link layer, may be a modulated or unmodulated carrier wave.

3.3 Post-amble The post signal of the physical layer frame information, irrelevant to the link layer, may be a modulated or unmodulated carrier wave.

4 Signs and Abbreviations

4.1 Signs The following signs are applicable to this document. dBm: characterize the ratio of power and 1mW. RSUt: Roadside Unit Transmitting Antenna. RSUr: Roadside Unit Receiving Antenna.